MAGIC Subregional Area Study

Phase I Report:
Current Conditions and Proposed Additional Studies

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TABLE OF CONTENTS

List of Figures ii

List of Tables ii

Executive Summary iii

1. Introduction 1

2. Recent Trends: Employment, Population and Development

2.1. Employment 6
2.2. Population and Households 8
2.3. Development/Growth Centers 11

3. Recent Trends: Transportation

3.1. Census Data 26
3.2. Roadways and Traffic 29
3.3. Analysis of Origins for Selected Links 31
3.4. Currently Operating Transit/Paratransit Services 40

4. Current Initiatives at Congested Areas 55

5. Next Steps: Proposed Additional Studies 69

6. Observations and Conclusions 78

APPENDIX A: Historic Traffic Volumes on Selected MAGIC Subregion Roadways

APPENDIX B: Comments on Draft Phase I Report

APPENDIX C: Technical Memoranda Prepared in Support of Draft Phase I Report

List of Figures

1-1 Study Area Map: Roads by Administrative System

2-1 Employers in MAGIC Subregion
2-2 Current/Recent Developments in MAGIC Region

3-1 Historic Traffic Count Locations
3-2 Super-Zones Defined for Select-Link Analysis
3-3 Select-Link Analysis—Count Locations on I-495
3-4 Select-Link Analysis—Count Locations on Route 2
3-5 Select-Link Analysis—Other Count Locations (East)
3-6 Select-Link Analysis—Other Count Locations (Central)
3-7 MAGIC-Area Transit: Town- or Privately-Sponsored Services
3-8 MAGIC-Area Transit: MBTA, LRTA, Private Carriers

4-1 Mobility Problems Identified in CMS Report
4-2 Projects in 2002-2007 Approved TIP, by Status
4-3 Town and/or Developer-Sponsored Studies & Projects
4-4 CTPS Studies in MAGIC Subregion—Current and Previous

List of Tables

2-1 Employment In MAGIC Towns, 1990-1999
2-2 Average Annual Employment By Major Industry Category
2-3 Employment Forecasts For MAGIC Towns
2-4 Population Change in MAGIC Towns, 1990-1999
2-5 Population Forecasts for MAGIC Towns
2-6 Household Forecasts for MAGIC Towns
2-7 Residential Building Permit Issuance For MAGIC Towns
2-8 Largest Employers In MAGIC Towns (Spring 2001)
2-9 Recent And Pending Developments in MAGIC Area

3-1 1990 Census: Work Trips By Mode And Town Of Residence
3-2 1990 Census: Work Trips By Mode And Workplace Town
3-3 Vehicles Per Capita Available To MAGIC Town Residents (1990 Census)
3-4 MAGIC Area Transit/Paratransit Services (Spring 2001)
3-5 Available Parking At Fitchburg Line Stations

4-1 Current TIP Projects By Status, September 2001

5-1 MAGIC Subregional Area Study: List Of Potential Projects/ Studies For Phase II

EXECUTIVE SUMMARY

In Year 2000, CTPS initiated a Subregional Area Study in the MAGIC subregion,[1] in response to requests from the Minuteman Advisory Group on Interlocal Coordination (MAGIC). The objectives of the study were to update and summarize information about current activity in the area: growth, new and proposed developments, traffic volumes, transit and paratransit services and usage, and perceived needs of local officials and the MAGIC group for transportation improvements and studies. The study is being conducted in two phases; this report summarizes the findings of **Phase I**, and provides direction for **Phase II**.

Phase I, the data-gathering and review effort, included the following:

- A review of historic and current growth levels
- Identification of the locations of the largest current employers as well as new and pending developments
- Review and analysis of historic traffic growth based on count data; estimation of origins of MAGIC area traffic at selected locations.
- Enumeration of currently-available transit services, and their limitations
- Interviews with MAGIC town planners and/or town managers, aimed at identifying outstanding traffic problems and potential future problems.
- Status update on pending transportation improvement projects, including TIP projects
- Compilation of a list of suggested study items/"next steps," based on interviews and suggestions by the MAGIC group.

It also included an examination of the potential for extending or expanding the existing local service operating within the Town of Bedford. Another item originally intended to be included (review of Maynard TDM-sponsored shuttle operation, and suggestions for improvement), was not completed because of delays in implementing that service. This item may be included in a later work program.

Key conclusions from Phase I include the following:

- High housing costs in this area are an important factor in keeping residential growth relatively constrained. In addition, town restrictions on numbers of allowable annual building permits can help to constrain residential population growth.

- However, industrial growth is occurring at a rapid pace, particularly in the I-495 corridor, on land previously undeveloped. Employees attracted to large new headquarter-type developments along I-495 are most likely to seek housing in the towns west of I-495 and southern New Hampshire, rather than within MAGIC communities themselves.

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[1] The communities included in the MAGIC area are Acton, Bedford, Bolton, Boxborough, Carlisle, Concord, Lexington, Lincoln, Littleton, Stow and Maynard.

- If not restrained, this industrial growth will contribute substantial additional traffic volumes to local roadways, many of which are two-lane rural-type roads heretofore unaccustomed to chronic congestion. Unfortunately, these communities, and the new developments locating there, are not designed as "transit-friendly" locations. The most appropriate alternatives to single-occupant driving for commuter purposes here are likely to be carpooling and vanpooling.

- The more easterly sections of the MAGIC area, including Lexington and adjacent towns such as Burlington, Billerica and Waltham, are served by a variety of paratransit-type shuttle and local-bus operations, which are typically funded in part by their town or employer sponsors. The town services enjoy modest ridership, comprised largely of relatively transit-dependent populations (i.e., low auto ownership) and occasional users: seniors, students, and low-wage job-holders. The employer shuttles similarly at targeted at specific markets, likewise have modest patronage, and are paid for largely by the users or their employers. The potential for expansion to include commuters from high-income, high-auto-ownership suburban markets is limited.

- The western-most parts of the MAGIC area, in particular, consist of low-density, formerly rural communities which simply cannot sustain either traditional transit services or paratransit services involving a paid operator, without incurring unacceptably high costs.

- The only reasonable long-term source of support for any such services is the large-scale[2] employers who generate the demand for them. The only employers for which such services may represent a worthwhile investment are those which have their own needs related to employee or customer transportation. The principal transportation needs expressed by MAGIC-area employers which *do* run or sponsor such services are parking shortages (as at Clock Tower Place, Maynard) and recruitment of clerical or maintenance staff (as at local supermarkets and hospitals). In communities where there *do* exist corporate or municipal patrons willing to support such services, CTPS could potentially provide assistance in developing and evaluating routes and schedules, if desired.

- In addition to transit/paratransit improvements, MAGIC representatives are interested in expansion of park-ride opportunities within their area, a new train station in Littleton at the intersection of Route 2 and I-495, several corridor studies, and the advancement of bikeway and other enhancement projects.

- Commuter rail is of particular interest to MAGIC representatives, who are concerned both about service limitations on the Fitchburg Line and about station parking constraints and the lack of alternative means of access to train stations. There is a strong belief that increased two-way train service would encourage reverse-commuting to job sites within the MAGIC communities. A recent CTPS study documented the potential high costs and modest benefits likely to be realized from augmenting existing reverse-direction peak-period train service.

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[2] At least 500 or more employees at a given location.

- Neither MAGIC group members nor town officials noted many areas where roadway capacity addition or enhancement was a desired counter-measure to increasing congestion. However, the Route 2A corridor in Acton and Littleton was identified as in need of arterial-type improvements (e.g., left-turn storage provision, access control, median treatment).

- The subregional divisions, while they are useful for some purposes, tend to result in groupings of dissimilar towns with different concerns and priorities, which are not easily addressed in a single transportation study. For future such studies, it would be more practical to define study areas which group towns which are similar and have similar problems or issues,[3] rather than trying to address the concerns of the entire area represented by the MAGIC Committee.

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[3] E.g., Bedford and Lexington might more usefully be grouped with Burlington, Billerica and Woburn for purposes of examining areawide transportation issues, even though such a grouping transcends subregional boundaries.

1. INTRODUCTION

This study grew out of a request from the Minuteman Advisory Group on Interlocal Coordination (MAGIC), a group which represents 12 towns in the northwest suburbs of the Boston metropolitan area: Acton, Bedford, Bolton, Boxborough, Carlisle, Concord, Hudson, Lexington, Lincoln, Littleton, Maynard and Stow. The group originally approached CTPS expressing an interest in identifying opportunities to increase alternative transportation options, as well as to add to or expand selected shuttle transit services; and requested a scope of work to address those issues. Over time and in consultation with MAGIC, the requested scope of work was modified to become Phase I of a subregional area study similar to others CTPS has undertaken throughout the metropolitan region. Phase I will be followed by a Phase II, which will include analyses of specific problems or opportunities identified in Phase I.

All these studies are an outgrowth of the Congestion Management System (CMS) planning efforts undertaken by CTPS in response to Federal mandates. These studies examine areas identified in CMS reports as experiencing high levels of congestion, defined in terms of numerous indicators including roadway travel times, transit schedule adherence, and park/ride lot vehicle occupancy.

Many of the major roadways in the MAGIC area were identified through CTPS monitoring efforts as having congestion or mobility problems; others were suggested by readers commenting upon the most recent CMS report (released in final form in January 2001). The roadways identified by either or both methods include: Routes 2 and 2A, particularly in Acton and Concord; Route 27 in Acton and Maynard; Route 3, the Middlesex Turnpike and Route 62 in Bedford; Route 4/225 in Lexington, Bedford and Carlisle; Route 126 in Lincoln and Concord Center; and I-95 (Route 128) in Lexington north of Route 2A. **Figure 1-1** illustrates the major roadways serving the subregion, identified by Administrative System.

In addition, overcrowding and late arrivals on some peak-period trains on the Fitchburg commuter rail line, as well as severely overcrowded parking lots at all stations, were identified as problems with existing transit service. More generally, MAGIC representatives see lack of transit opportunities, including reverse commuting opportunities, and other transportation options, as a particular problem. They are especially interested in finding new transit options for work and other trips, to reduce the use of the single-occupant auto, which is the predominant mode. Local officials are very vocal in expressing the belief that transit improvements would reduce congestion in general and the pressure on Route 2 in particular.

In previous years, there have been numerous other studies conducted in the towns of the MAGIC subregion, many of them focused on Routes 2 and 3, the principal radial highways serving the area and connecting the I-95 and I-495 beltways. Route 2 within the MAGIC area is a fully grade-separated limited-access highway west of Taylor Road in Acton. East of Taylor Road, Route 2 is a divided major arterial, generally two lanes wide in each direction with turning lanes at signalized intersections. East of I-95 (Route 128) in Lexington, Route 2 again becomes a limited-access highway for the remaining six-plus miles of its length to Alewife Brook Parkway in Cambridge. At one point in the 1970s, the section of Route 2 between Acton and Lexington was proposed for upgrading to limited-access status, to connect with the limited-access sections on east and west. That concept having been rejected, later efforts focused on safety and flow improvements to the existing road while retaining the existing cross-section and at-grade intersections. A CAC (Citizens' Advisory Committee) was created in the early 1990s as an advisory group for the large-scale CTPS Route 2 study that occurred at that time. Later, the CAC was reactivated at local request to serve as an ongoing Task Force reviewing progress on, and suggesting modifications to, the projects recommended by the CTPS study:

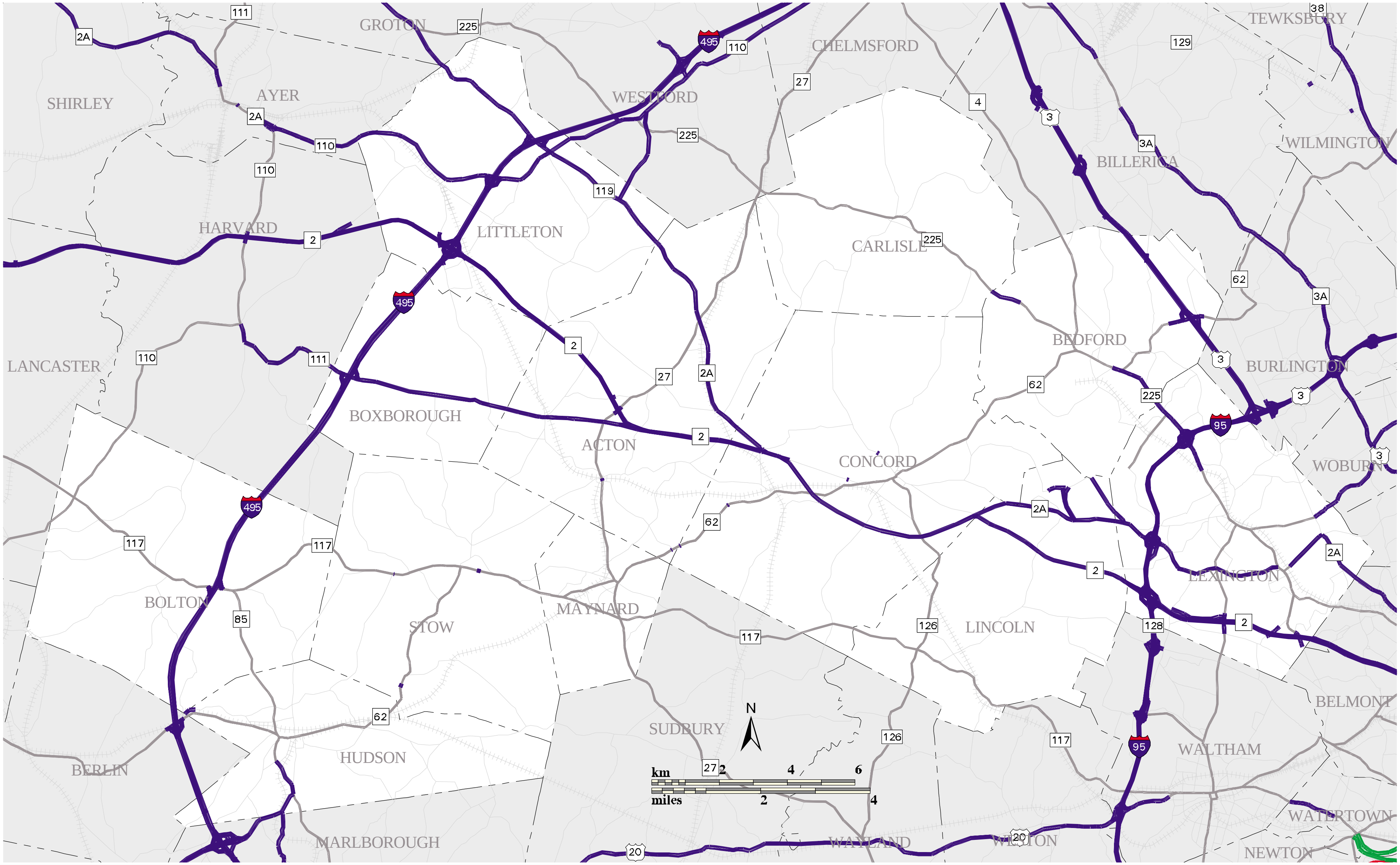
- installing median barriers along the undivided sections of Route 2.
- grade-separating the major intersection at Crosby's Corner on the Lincoln-Concord town line, where Route 2 meets the Cambridge Turnpike.
- alternatives for replacing the Concord rotary, the major bottleneck on this section of Route 2.
- safety issues at the Taylor Road signalized intersection, as well as improved access across Route 2 in East Acton.

As of now, median barrier installation on Route 2 has been partially completed. Progress on the Crosby's Corner project is awaiting Federal approval of the Final Environmental Impact Statement for that project, after which Final Design can commence. CTPS is currently working with the Committee on studies of alternatives for redesign of the Concord rotary and the area between the rotary and Route 27 in Acton.

On Route 3, the focus of MassHighway for the past 10 years has been the proposed widening to three lanes in each direction. Bedford is the only MAGIC town directly traversed by Route 3; but other towns, including Carlisle and Concord are reportedly also affected by traffic avoiding congestion on Route 3 by seeking shortcuts using local roads in both towns. Some of this bypass activity should be reduced once additional capacity is available on Route 3.

The Route 2 work is continuing, and Route 3 will be under construction shortly. These projects primarily affect the eastern half of the MAGIC area, which is already fairly densely developed to the degree allowed by local zoning and preservation activities, available infrastructure, and local wishes. No major projects have been proposed or undertaken within recent years on roadways in the western end of the subregion (Littleton, Boxborough, Stow or Bolton), other than roadway reconstruction, bridge replacement, and other activities representing essentially maintenance of existing roads. Historically, the roadway infrastructure has generally been more than adequate to support the limited industrial and commercial establishments located in these predominantly rural communities. However, it is these towns which are experiencing (and generally welcoming) the current surge in large-scale development. As development pressures increase, so will traffic demand on the local roadway systems of these and neighboring towns.

This Phase I report presents a "snapshot" of existing growth and travel patterns in the MAGIC area, as well as local attitudes toward new development, land use, and transportation improvements. It compiles currently available data from a variety of



CTPS

MAGIC Subregional Area Study

Roadway Jurisdiction:

▬ **MassHighway**

▬ **MDC**

▬ **Mass. Turnpike Authority**

▬ **Local**

(Source: CTPS GIS/MassHighway)

Figure 1-1

Study Area Map: Roads by Administrative System

February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-08fcn.aml sources, and includes a list of planning studies or activities which may merit additional data collection and analysis, to explore promising opportunities and to address recognized transportation deficiencies. It acknowledges the preferences expressed by MAGIC members for transit- or paratransit-type solutions; but recognizes that the suburban-rural nature of most of the study area severely limits the applicability and potential usefulness of traditional transit services in meeting these needs. The report was developed with the assistance of town officials, including planners, engineers, and town managers, who consented to be interviewed and to share their views; as well as in cooperation with the MAGIC Committee.

2. RECENT TRENDS: EMPLOYMENT, POPULATION, DEVELOPMENT

2.1 Employment

Table 2-1, based on data from the Massachusetts Department of Employment and Training (DET), indicates that, at least up until 1999, employment in the MAGIC communities overall fell during the recession of the early 1990s, and has only recently climbed back up to levels seen in 1985. The decline occurred in towns which previously had had the highest employment levels, notably Bedford and Maynard. The latter town lost its largest employer when Digital closed. Both towns have been encouraging the interest of prospective businesses looking to fill the gaps left by the departed companies, and both have started to recoup much of the employment lost in the recession. Lexington has already regained much of the employment lost in the early 1990s, while Concord and Acton have also experienced substantial increases in employment. **Table 2-2** illustrates the decline in manufacturing in towns such as Bedford, Lexington and Maynard—replaced in most instances by increases in service employment. These towns resemble others within the I-495 belt, in their interest in providing a broader municipal tax base without compromising the quality of life in their residential neighborhoods.

TABLE 2-1
Employment in MAGIC Towns,
1990-1999

	1990	1995	1999	Absolute Change 1990-1999	% Change 1990-1999
Acton	9,395	9,767	10,469	1,074	11%
Bedford	24,620	17,273	20,083	-4,537	-18%
Bolton	1,471	1,734	2,268	797	54%
Boxborough	2,286	1,833	2,162	-124	-5%
Carlisle	649	542	917	268	41%
Concord	11,643	11,009	12,661	1,018	9%
Hudson	8,381	9,241	9,178	797	10%
Lexington	19,411	17,838	21,421	2,010	10%
Lincoln	1,671	1,489	1,625	-46	-3%
Littleton	5,342	5,105	5,835	493	9%
Maynard	7,403	5,058	4,210	-3,193	-43%
Stow	2,260	2,110	2,088	-172	-8%
Total MAGIC	94,532	82,999	92,917	-1,615	-2%

Source: Massachusetts Department of Employment and Training, Series E202, from DET, "Employment and Wages in Massachusetts' Cities and Towns," December 2000. (Note: not updated to include Year 2000 as of October 2001.)

TABLE 2-2
Average Annual Employment
By Major Industry Category

Town	Year	Total Employment	Manu- facturing	% of Total	Wholesale, Retail Trade	% of Total	Finance Insurance Real Estate	% of Total	Services	% of Total
Acton	1990	9,395	3,084	33%	2,929	31%	257	3%	1,544	16%
	1999	10,469	1,941	19%	2,687	26%	349	3%	3,525	34%
Bedford	1990	24,620	10,050	41%	2,561	10%	170	1%	6,442	26%
	1999	20,083	5,204	26%	2,428	12%	260	1%	7,065	35%
Bolton	1990	1,471	295	20%	174	12%	NA	---	674	46%
	1999	2,268	226	10%	971	43%	17	1%	564	25%
Boxborough	1990	2,286	70	3%	893	39%	8	0%	1,054	46%
	1999	2,162	813	38%	396	18%	15	1%	598	28%
Carlisle	1990	649	22	3%	9	1%	13	2%	406	63%
	1999	917	115	13%	24	3%	6	1%	344	38%
Concord	1990	11,643	2,780	24%	1,942	17%	718	6%	4,195	36%
	1999	12,661	1,083	9%	1,852	15%	341	3%	6,825	54%
Hudson	1990	8,381	4,861	58%	1,444	17%	257	3%	750	9%
	1999	9,178	4,636	51%	1,844	20%	323	4%	939	10%
Lexington	1990	19,411	5,007	26%	4,072	21%	997	5%	7,054	36%
	1999	21,421	2,341	11%	3,106	14%	713	3%	12,669	59%
Littleton	1990	5,342	2,940	55%	506	9%	72	1%	1,214	23%
	1999	5,835	2,115	36%	916	16%	156	3%	1,551	27%
Lincoln	1990	1,671	39	2%	189	11%	27	2%	935	56%
	1999	1,625	NA	---	113	7%	56	3%	925	57%
Maynard	1990	7,403	5,368	73%	1,012	14%	207	3%	318	4%
	1999	4,210	1,479	35%	1,127	27%	201	5%	841	20%
Stow	1990	2,260	112	5%	1,190	53%	46	2%	551	24%
	1999	2,088	109	5%	1,007	48%	37	2%	456	22%
OVERALL	1990	94,532	34,628	37%	16,921	18%	2,772	3%	25,137	27%
	1999	92,917	20,062	22%	16,471	18%	2,474	3%	36,302	39%

Notes: 1. Row totals do not add to 100%, because not all industry categories are shown.
2. Maynard officials believe that these totals underrepresent Maynard employment in 1999.

Source: Division of Employment and Training, *Employment and Wages in Massachusetts Cities and Towns 1990-1999*, ES-202 Program, December 2000.

Unfortunately, the replacement of a single large employer (such as Digital in Maynard) by many smaller employers (as in the current Clock Tower Place) increases the difficulty of promoting the kind of collective transportation alternatives of most interest to MAGIC. This is because in most office complexes where space is leased, there is no single corporate policy encouraging carpooling and vanpooling, and no centralized corporate mechanism for matching would-be ridesharers.

Other MAGIC towns, notably Lincoln, Carlisle, Stow and Bolton, have not encouraged, or have actively discouraged, industrial and commercial development, except for small-scale local retail activities. Much of the employment identified in these towns is actually municipal government or school employment, and there appears to be a willingness to forego the tax benefits of attracting office developments or industry in order to maintain rural character.

Finally, some of the towns located on the western fringe of the MAGIC area (Littleton, Boxborough and Hudson) are actively seeking development. These towns are all located along I-495. They did not lose significant employment in the recession of the early 1990s, because their employment was relatively low to begin with. In the thriving real-estate and development environment which currently exists, these towns have the opportunity to exploit their proximity to I-495, a high-design expressway which currently has ample excess capacity in comparison with other regional roadways. Boxborough and Littleton in particular have demonstrated willingness to accommodate large-scale office/R&D and industrial development close to the interchanges which serve their towns. Both towns expect sharp increases in employment as a result of adding millions of square feet of office/R&D over the next two years. Other nearby towns are anticipating strong pressures to develop housing and ancillary businesses as a result of Boxborough and Littleton's hosting of Cisco.

Table 2-3 gives MAPC's employment forecasts for all MAGIC towns over the next 20 years. They indicate quite high levels of assumed employment growth overall, with Concord, Boxborough, Hudson and Lexington experiencing the greatest absolute growth levels; while Stow, Bedford and Maynard are predicted to experience modest growth or reduction in employment. Most likely, the distribution of employment growth among towns will be somewhat different (higher in Maynard and Bedford, lower in Concord and Lexington). The availability of developable land in MAGIC-area communities receptive to new industrial and commercial growth is not in doubt. Whether population and housing growth can support high levels of industrial/ commercial development is less clear. The likelihood is that workers attracted to new jobs in these areas will commute from the west and north, including New Hampshire, adding to area traffic.

2.2 Population and Households

Table 2-4 shows 1990 and newly released 2000 Census population totals for MAGIC towns. These show Acton and Littleton with the greatest absolute increases in population in the nine-year period for which data are presented. Several smaller towns

TABLE 2-3
Employment Forecasts for MAGIC Towns

	1990	2010	2020	Absolute Change 1990-2020	% Change 1990-2020
Acton	9,395	11,334	11,908	2,513	27%
Bedford	24,620	23,451	25,174	554	2%
Bolton	1,471	2,927	3,496	2,025	138%
Boxborough	2,286	6,404	6,469	4,183	183%
Carlisle	649	848	888	239	37%
Concord	11,643	14,549	15,985	4,342	37%
Hudson	8,381	11,291	12,089	3,708	44%
Lexington	19,411	21,608	22,720	3,309	17%
Lincoln	1,671	1,743	1,843	172	10%
Littleton	5,342	7,922	8,248	2,906	54%
Maynard*	7,403	4,559	4,484	-2,919	-39%
Stow	2,260	2,221	2,346	86	4%
Total MAGIC	94,532	108,857	115,650	21,118	22%

Source: Metropolitan Area Planning Council (Latest update: website, current October 2001).

* NOTE: Maynard officials believe that current employment totals and future projections underestimate growth that has taken place there since 1995.

had higher percentage increases than these two; but the higher percentages reflect the lower base population values in those towns. Overall, the rate of population growth was fairly modest—6 percent over nine years.

Projections for this area suggest a greatly accelerated rate of growth in population and, especially, in numbers of households in this region between now and 2020 (**Tables 2-5** and **2-6**). The overall growth rates between 1990 and 2020 for population and households are 26 percent and 38 percent respectively. These rates are consistent with growth rates projected by MISER[1] for these towns, although they are somewhat higher than one would expect looking at the Census figures for recent years, also included in **Table 2-5**. Acton, Lexington, and most recently, Littleton appear to be the most active towns in terms of population growth and new household formation, as seen also in **Table 2-7**, showing building permit issuance for new residential construction over the past three years. The vast majority of new housing in these towns is single-family, reflecting local preferences and local zoning. It also tends to be high-priced housing on large lots, development which is inherently auto-centric and which results in communities ill-adapted to support any kind of transit services.

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[1] Massachusetts Instititute for Social and Economic Research, University of Massachusetts at Amherst, Population Estimates for Massachusetts Towns, released September 2000; accessible through website http://www1.miser.umass/datacenter/population.

TABLE 2-4
Population Change in MAGIC Towns, 1990-1999

	1990	1995	1999	Absolute Change 1990-1999	% Change 1990-1999
Acton	17,860	18,480	19,332	1,472	8%
Bedford	12,971	13,381	13,799	828	6%
Bolton	3,134	3,256	3,402	268	9%
Boxborough	3,222	3,782	4,132	910	28%
Carlisle	4,333	4,521	4,808	475	11%
Concord	17,078	17,704	17,804	726	4%
Hudson	17,217	17,608	17,922	705	4%
Lexington	28,974	29,226	29,583	609	2%
Lincoln	7,696	7,835	7,951	255	3%
Littleton	7,165	7,740	8,170	1,005	14%
Maynard	10,331	10,313	10,473	142	1%
Stow	5,325	5,642	5,891	566	11%
Total MAGIC	135,306	139,488	143,267	7,961	6%

Source: Population Estimates Program, Population Division, U.S. Census Bureau, Washington DC 20233 (SU-99-10), Population Estimates for Minor Civil Divisions, Annual Time Series, July 1, 1990 to July 1, 1999. Internet Release Date: October 20, 2000.
NOTE: see **Table 2-5** for recently released 2000 Census estimates of population.

Stow and Bolton, have implemented, or are considering implementing, restrictions on the number of new residential building permits to be issued annually, as a means of slowing residential growth. Such restrictions could become more common as continued industrial and commercial development pressures are exerted on towns located along I-495. It is unclear whether they are effective mechanisms for slowing down growth, or whether, instead, they act as a spur to property development by prompting developers to take advantage of available building permit "slots." In Carlisle, Concord and Lincoln particularly, the high price of housing itself acts as a deterrent to new residential development.

The combination of high-priced residential real estate, zoning and other restrictions on new housing development, plus increased office and industrial development on a large scale to expand the tax base, results in an imbalance of housing and jobs, with prospective employees unable to live in the towns where they work. This issue is discussed more extensively in the 1998 CTPS report *The Demographics of Commuting*[2]. As mentioned above, it also keeps densities down, making it difficult to serve these communities with collective transportation modes such as buses.

TABLE 2-5
Population Forecasts for MAGIC Towns

	Assumed 1990 Baseline	2000 Census	Estimated 2010	Estimated 2020	Absolute Change 1990-2020	% Change 1990-2020
Acton	17,872	20,331	22,704	24,017	6,145	34%
Bedford	12,996	12,595	13,496	13,787	791	6%
Bolton	3,134	4,148	5,083	5,849	2,715	87%
Boxborough	3,343	4,868	6,285	7,397	4,054	121%
Carlisle	4,333	4,717	5,738	6,561	2,228	51%
Concord	17,076	16,993	18,888	20,322	3,246	19%
Hudson	17,233	18,113	19,437	20,308	3,075	18%
Lexington	28,974	30,355	33,235	34,039	5,065	17%
Lincoln	7,666	8,056	9,116	9,707	2,041	27%
Littleton	7,051	8,184	8,854	9,438	2,387	34%
Maynard	10,325	10,433	11,472	12,078	1,753	17%
Stow	5,328	5,902	6,662	7,022	1,694	32%
Total MAGIC	135,331	144,695	160,970	170,525	35,194	26%

Source: Metropolitan Area Planning Council (Latest update: website, current October 2001), except for 2000 Census data (released May 2001; available on U.S. Census Bureau website).

2.3 Development/Growth Centers[3]

The eastern MAGIC area, together with the adjacent towns of Burlington and Billerica, has been a zone of intense industrial growth since the 1970s. Lexington and Bedford in

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[2] Falbel, Stephen, *The Demographics of Commuting in Greater Boston*, Central Transportation Planning Staff, 2nd Edition Revised, August 1998; see especially pp. 19-31.

[3] In characterizing travel behavior, the greatest attention is paid to decisions about where people live, and where they work, because these are the decision which influence most directly the volume of traffic needed to be served in a particular area. There are, of course, reasons for travel besides work, and travelers other than employed persons (e.g., students, retired, elderly, self-employed). But these trips tend to be non-routine and therefore non-predictable, and are related to the existence of activity centers, which usually tend to be employment centers as well. In urban settings, work and non-work trips can frequently share the same general-purpose transit-type services, because volumes are high enough. In suburban settings, typically, the same transit or paratransit-type services can*not* serve both work and non-work trips (because demands are too low to justify general-purpose services) but must be targeted to particular markets.

TABLE 2-6
Household Forecasts for MAGIC Towns

	Assumed 1990 Baseline	Estimated 2000	Estimated 2010	Estimated 2020	Absolute Change 1990-2020	% Change 1990-2020
Acton	6,600	7,711	8,826	9,734	3,134	47%
Bedford	4,479	4,433	4,784	5,014	535	12%
Bolton	1,052	1,467	1,787	2,117	1,065	101%
Boxborough	1,363	2,019	2,591	3,070	1,707	125%
Carlisle	1,457	1,757	2,039	2,413	956	66%
Concord	5,693	5,809	6,612	7,437	1,744	31%
Hudson	6,362	7,041	7,566	8,209	1,847	29%
Lexington	10,515	11,979	12,747	13,569	3,054	29%
Lincoln	2,632	3,011	3,320	3,669	1,037	39%
Littleton	2,562	2,927	3,407	3,757	1,195	47%
Maynard	4,051	4,257	4,738	5,200	1,149	28%
Stow	1,793	2,139	2,371	2,587	794	44%
Total MAGIC	48,559	54,550	60,788	66,776	18,217	38%

Source: Metropolitan Area Planning Council (Latest update: website, current February 2001).

particular have capitalized on their proximity to I-95 (Route 128), Route 2 and Route 3 to allow intensely industrial areas or corridors to develop close to the highways. These include:

- in Lexington, the Hayden Avenue/Spring Street area east of I-95, as well as Hartwell Avenue on the west side of I-95
- in Bedford, the Wiggins Avenue and Hartwell Road areas adjacent to Hanscom Field, and the Middlesex Turnpike/Route 62 area close to the town boundaries with Billerica and Burlington.

These areas, together with the Baker Avenue and Virginia Road areas in Concord, are occupied primarily by multi-story office buildings, with tenants in the technology, publishing, light manufacturing, insurance/medical, and other industries. The areas account for a large proportion of total employment in these towns: the Hartwell Avenue area in Lexington accommodates an estimated 2,900 employees; the Hayden Avenue/Spring Street area, an estimated 3,000 employees. In Bedford, the estimated employment on Crosby Drive is at least 2200 people; while another 1,100 are employed on Middlesex Turnpike at present, with more expected to be added.

TABLE 2-7
Residential Building Permit Issuance for MAGIC Towns

	1998: bldgs	1999: bldgs	2000: bldgs	2000: units	2001: bldgs**	2001: units**
Acton	73	93	108	126	44	44
Bedford	19	31	21	21	9	9
Bolton	n/a	n/a	n/a	n/a	n/a	n/a
Boxborough	19	34	17	17	13	13
Carlisle	19	25	24	24	19	19
Concord	33	29	24	24	8	8
Hudson	17	n/a	n/a	n/a	n/a	n/a
Lexington	38	63	77	79	67	69
Lincoln	12	7	16	16	3	3
Littleton	41	49	73	73	47	47
Maynard	22	13	10	10	22	22
Stow	26	23	41	41	25	25
TOTAL*	319	367	411	431	257	259

*excluding towns for which no data is available
**through October 2001

Source: MISER (Mass. Institute for Social and Economic Research [www.umass.edu/miser])—data reported by towns, updated December 2001.

In Lexington, Bedford and, to a lesser extent, Concord, new industrial development is likely to consist in more intense redevelopment of previously occupied industrial land, rather than totally new construction in previously undisturbed land. Other towns, including Acton, Maynard and, to a lesser extent, Stow, are interested in adding moderate levels of industrial development; however, their vacant industrial areas tend to be smaller parcels with less-than-ideal highway access, which are therefore less attractive to potential builders than sites located adjacent to highways.

Table 2-8 lists the largest employers located within the MAGIC area (firms of 200 or more employees). The colored markers on **Figure 2-1** represent employers of 100 or more people at one location, within the MAGIC towns and extended to include Burlington and Billerica. These sites are highlighted in color because typically they represent the densest concentrations of employment within individual towns. They are of interest because they have a critical mass of employment large enough to allow ride-sharing matching efforts to have some hope of success. Businesses smaller than this size are unlikely to be good candidates for commuter ride-sharing initiatives because the pool of potential ride-share clients is so small that matches are hard to find.[4]

The smaller black dots on **Figure 2-1** represent employers reportedly having more than 10 and fewer than 100 employees. There is a much higher number of these locations than of the large employer sites. They were located using address-matching computer techniques, which were successful in locating only about 55 percent of the total number of firms identified (total identified: about 1,050); consequently, *not all locations within this latter category are represented in **Figure 2-1***. However, the map provides a good general overview of where work-trip destinations are located, within MAGIC and in the two adjacent employment-center towns.

The corridors and areas of highest employment density are:
Route 3/Middlesex Turnpike in Bedford and Billerica
Route 4/225 and Hartwell Avenue on the western end of Lexington
Hartwell Road/Wiggins Avenue in Bedford
the Hudson industrial areas east of Route 85 and into downtown Hudson

Other areas have fewer large firms, but clusters of smaller firms located close together:
Route 62 close to the junction of Maynard, Acton and Concord
Baker Avenue area/West Concord
Junction of Route 2 and Route 27, Acton
Clocktower Place, Maynard

One other area of concentrated activity is Hanscom Field and Hanscom Air Force Base. About 500 people are employed on the civil aviation side of this facility, of whom about 20 are Massport employees.[5] The Air Force Base attracts approximately 13,000 people per day, as mentioned in the recent (July 2000) Environmental Assessment/FONSI of a proposed relocation of 1000 employees from the Mitre Corporation facility in Bedford to Hanscom.[6]

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[4] This is also true of situations where many small employers are located at a single site, e.g., in office parks or large leased office buildings: these sites are notoriously difficult markets for ride-sharing. It should be noted that Maynard's Clock Tower Place, which was fully occupied until the start of the recent recession, is unique, and not representative of most such sites. This is because the extreme limitations on available parking at Clock Tower have created strong incentives for the building management, which needs to attract and satisfy tenants, to offer alternatives to ample parking availability. These include marketing alternative modes of commuting aggressively, and promoting the use of its shuttles to remote parking sites and the South Acton train station. Even at Clock Tower Place, however, there have not been any vanpools created to our knowledge, despite constraints that should make vanpooling a desirable choice for commuters to this location.

[5] The remainder include FAA tower personnel, MIT personnel, employees of East Coast Aero Tech, concession operators, and others.

[6] *Environmental Assessment/Finding of No Significant Impact (FONSI): Relocate Management Personnel and Renovate Acquisition Management Facility (Building 1614),* Hanscom AFB, Massachusetts, United States Air Force, July 2000.

TABLE 2-8
Largest Employers in MAGIC Towns
(Spring 2001)

TOWN	EMPLOYER
1. Employer Sites with More than 500 Employees	
Bedford	Medisense Millipore Mitre Raytheon US Air Force US Veterans Hospital Corning Lasertron
Bolton	Future Electronics
Concord	Emerson Hospital Sybase
Hudson	Intel
Lexington	D E Wolfe Companies Lockheed Martin Imaging Systems MIT Lincoln Laboratory Raytheon Stride Rite Corporation Compaq Computer
Littleton	Compaq Computer
Maynard	Stratus Computer
Stow	Compaq Computer
2. Employer Sites with 200-500 Employees	
Acton	Children’s World/Aramak Fujitsu Nexion Inc Haartz Corp Honeywell Data Instruments
Bedford	Carleton-Willard Village Employers Insurance of Wausau Fujifilm Microdisks Hologic Natures Heartland Progress Software Project Software & Development Renaissance Bedford Hotel RSA Security Scitex America Corp Sungard Brokerage Systems

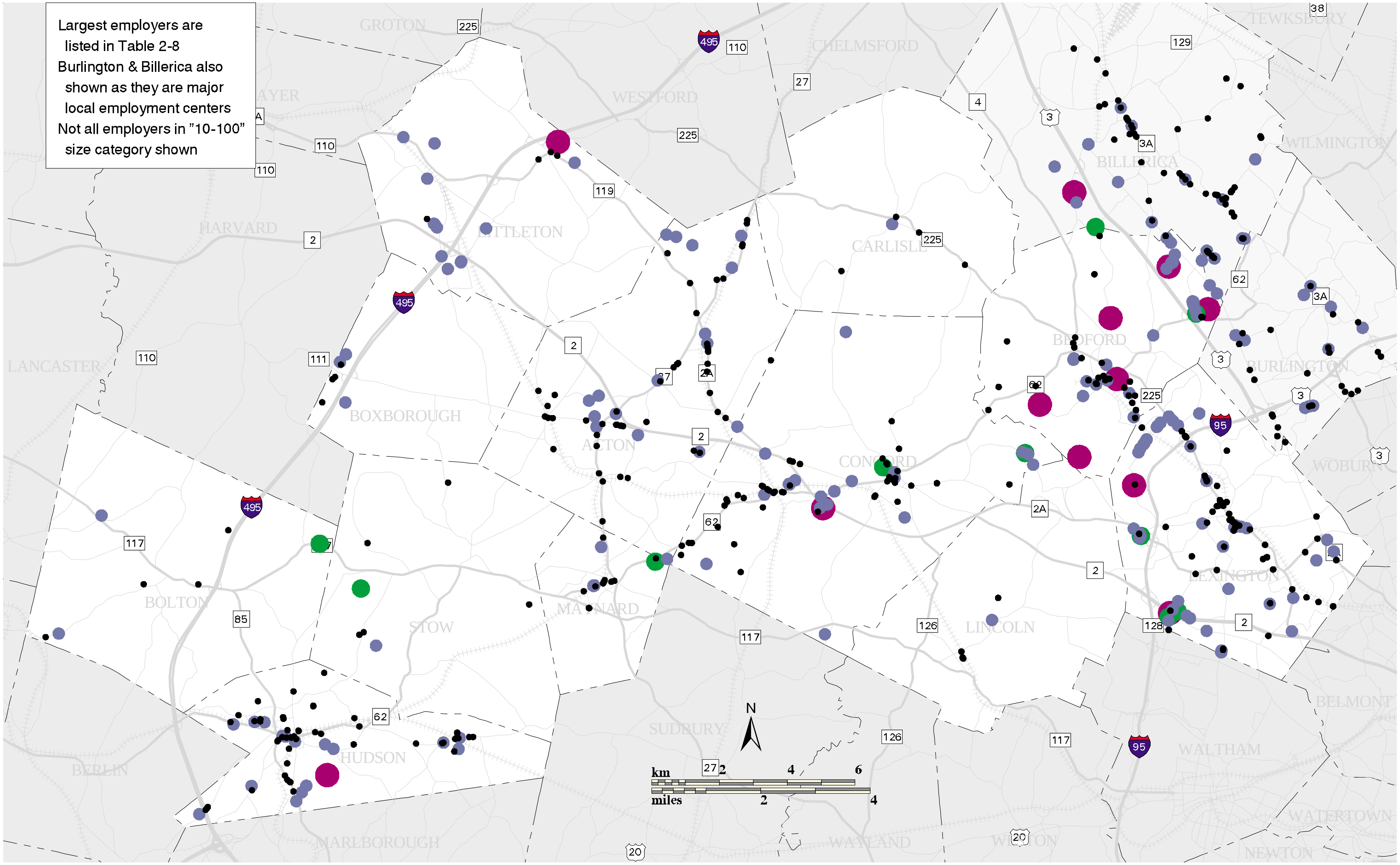
Table 2-8 (cont'd)

Boxborough	Cytyc Corp
Concord	Army Corps of Engineers Earth Technology Corp Lucent Technologies Mass. Correctional Institution New England Deaconess Association One Source Information Services Solid Works Corp Westford Group Inc
Hudson	ACT Automated Components ACT Manufacturing Hudson Lock Inc RR Donnelley/Hudson Manufacturing Wal-Mart
Lexington	Compaq Computer Corp Data Resources Inc Fresenius Medical Care Instrumentation Laboratory Logica Inc Mercer Management Consulting Sunridge (Mediplex) Home Health Care
Littleton	Delta Design Middlesex Corp Verifine Products XRE Corp Xyplex Networks
Maynard	Breakaway Solutions Monster.com

Sources: InfoData, *American Business Disk* (2000); Dun & Bradstreet *Regional Business Directory for Massachusetts* (2000); supplemented by telephone surveys of businesses and discussions with MAGIC members.

These are the areas which would need to be targeted in order to reach the largest number of current employees.

In addition to these locations, newly developing industrial sites represent potential opportunities to initiate ride-sharing initiatives. **Table 2-9** lists, and **Figure 2-2** illustrates, currently pending or newly constructed development projects within MAGIC. Among these, the industrial and commercial projects tend to be located within the same areas identified above as concentrated employment areas, with one exception: the large new developments planned or under construction along I-495 in Littleton and Boxborough. The planned industrial parks and corporate headquarters in these towns are not larger than many of the similar industrial areas in Lexington, Bedford or Hudson. They do represent a broadening of the locus of potential industrial activity within MAGIC, however, and a significant change for the particular communities in which they are being built.

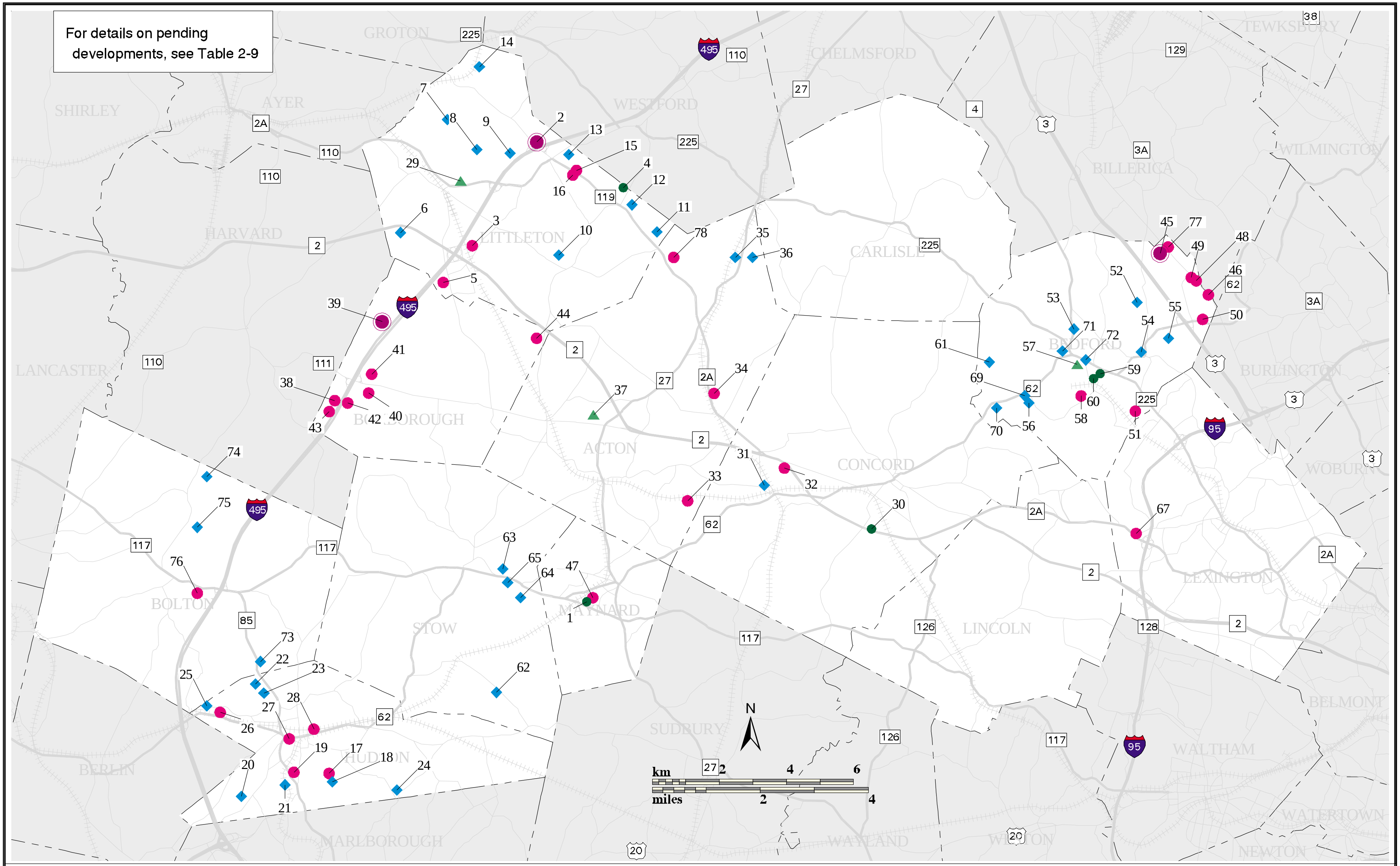


Largest employers are
listed in Table 2-8
Burlington & Billerica also
shown as they are major
local employment centers
Not all employers in "10-100"
size category shown

CTPS
MAGIC
Subregional
Area Study

- ● Over 1,000 employees
- ● 500 to 1,000 employees
- ● 100 to 500 employees
- • 10 to 100 employees

Figure 2-1
Employers in
MAGIC Subregion



For details on pending developments, see Table 2-9

CTPS

MAGIC Subregional Area Study

Site ID#

- ◉ Commercial/Industrial: 500,000 sf or greater
- ● Commercial/Industrial: Less than 500,000 sf
- ◆ Residential
- ▲ Public Infrastructure/Schools
- ● Other

Figure 2-2
Current/Recent Developments in MAGIC Subregion

February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-09dev.aml

TABLE 2-9
Recent and Pending Developments in MAGIC Area

SITE ID #*	TOWN	TITLE	DEVEL. TYPE	SIZE
35	Acton	Acton Retirement Community	Residential Multi-Family	135 units retiremt
34	Acton	Brookside Shops	Commercial Retail	82416 sf
33	Acton	Industrial site	Mfg Light	unknown
78	Acton	Nagog Woods	Office	2 bldgs. tot. 100000 sf
37	Acton	New Jr High School	School Public	unknown
36	Acton	Robbins Mill Estates	Residential Single-Family	125 units
50	Bedford	213 Burlington Road	Office	79500 sf
49	Bedford	50 Middlesex Turnpike	Office	unknown
48	Bedford	54 Middlesex Turnpike	Office	unknown
51	Bedford	6 Preston Court	Office	unknown
71	Bedford	Avalon Bay	Residential Multi-Family	144 units (w/afford)
45	Bedford	Bedford Woods	Industrial Light	730000 sf
72	Bedford	Blake Block	Residential Mixed	6 apt 12k retail 15k office
69	Bedford	Caesar Jones	Residential Single-Family	8 sf, 12 town-house
54	Bedford	Daugherty Property	Residential Single-Family	5 lots
56	Bedford	Deer Meadow	Residential Single-Family	unknown
77	Bedford	Gutierrez Property	Office	90000 sf
61	Bedford	Hillcrest Ave Property	Residential Single-Family	2 lots
53	Bedford	Lane Farm	Residential Single-Family	5 detached, 2 attached
58	Bedford	Larson Bldg	Office	na
59	Bedford	Learn to Grow Day Care	Other	unknown
57	Bedford	Middle School Addition	School Public	unknown
55	Bedford	Page Hill	Residential Single-Family	40+ lots
60	Bedford	Patriot Pediatrics	Other	unknown
70	Bedford	Princeton Properties	Residential Multi-Family	288 units (w/ afford)
52	Bedford	Sweeney Ridge	Residential Single-Family	28 lots
46	Bedford +	45 Middlesex Turnpike	Office	318000 sf
76	Bolton	Bolton Office Pk (Flatley)	Office	currently half-occupied

Table 2-9 (cont'd)

73	Bolton	Danforth Woods	Residential Single-Family	30 units
74	Bolton	Northwoods Estates	Residential Single-Family	28 units
75	Bolton	Quail Run	Residential Single-Family	10 units
43	Boxborough	340 Codman Hill Rd	Industrial Light	33600 sf
41	Boxborough	Boxborough Executive Center	Office	225000 sf
39	Boxborough	Cisco Systems	Industrial Light	900000 sf
40	Boxborough	Cisco Systems	Industrial Light	277000 sf
38	Boxborough	Codman Hill Tech Center	Office	100000 sf
42	Boxborough	Holiday Inn Expansion	Hotel/Motel	+60 rooms
44	Boxborough	Shreiber Property (old 3Com)	Industrial Light	175000 sf
32	Concord	GenRad Site Expansion	Office	2bldgs, 200 ksf added
30	Concord	Next Generation Childrens Ctr	Other	
31	Concord	V of A Assisted Living	Residential Mixed	78 units
27	Hudson	2-3 Story Office	Office	100000 sf(?)
21	Hudson	Brigham Hill Ph II and III	Residential Single-fam	54 units
22	Hudson	Danforth Woods	Residential Single-fam	37 units
23	Hudson	Falls Brook	Residential Single-fam	19 units
24	Hudson	Heritage Drive	Residential Single-fam	26 units
26	Hudson	Hotel	Hotel/Motel	50 units(?)
17	Hudson	Intel Mod 4 Expansion	Mfg Light	120000 sf expansn
28	Hudson	Office R & D	Industrial Light	100000 sf(?)
20	Hudson	Pheasant Trail	Residential Single-fam	21 units
25	Hudson	Simrah Gardens	Residential Multi-fam	144 units
18	Hudson	Villages at Quail Run	Residential Mixed	150 units assis lvng
19	Hudson	Washington Square Plaza Expansion	Commercial Retail	46752 sf
68	Lexington	15 Hartwell Avenue	Office	
66	Lexington	Avalon at Lexington	Residential Multi-Family	
67	Lexington	Sheraton Addition	Hotel/Motel	
15	Littleton	Andrews Crossing North	Commercial Retail	80200 sf
16	Littleton	Andrews Crossing South	Commercial Retail	29700 sf
11	Littleton	Apple D-Or	Residential Single-fam	60 units
2	Littleton	Cisco Systems	Industrial Light	650000 sf

Table 2-9 (cont'd)

9	Littleton	Delaney Drive	Residential Single-fam	14 units
8	Littleton	Gray Farms	Residential Single-fam	20 units
5	Littleton	Gutierrez Property	Industrial Light	175000 sf
12	Littleton	Mary Shepherd Farm	Residential Single-fam	26 units
14	Littleton	Matawanakee Betterment Project	Residential Single-fam	40 units
4	Littleton	Nashoba Lodge/Ski Area	Other	unknown
29	Littleton	New High School	School Public	unknown
3	Littleton	Nordbloom/245 Foster	Office	133000 sf
13	Littleton	Partridge Estates	Residential Single-fam	7 units
10	Littleton	Richards Way	Residential Single-fam	7 units
6	Littleton	Upper Whitcomb Ave	Residential Single-fam	14 units
7	Littleton	White Tail Way	Residential Single-fam	44 units
47	Maynard	Clocktower II	Office	400000 sf
1	Maynard	Parking--Clocktower Place	Other	500 parking spaces
64	Stow	Elizabeth Brook	Residential Single-Family	12 units
65	Stow	Lanes End	Residential Single-Family	7 units
63	Stow	Meetinghouse	Residential Single-Family	61 units
62	Stow	Wildlife Woods	Residential Single-Family	67 units

*ID number that appears in **Figure 2-2**

Source: Interviews with town planners, other officials, December 2000-March 2001.

The I-495 corridor has received particular attention during the past several years, as the result of initiatives undertaken by elected officials, the Massachusetts Technology Collaborative, the Metropolitan Area Planning Council, and cities and towns adjacent to I-495. The mission of the I-495 Technology Corridor Initiative is to serve as a regional forum on growth within these cities and towns. Objectives include assessing the impact of economic growth on municipalities, particularly with respect to quality-of-life issues; developing a vision of the corridor's future, given the objectives and values of individual member communities; and generating ideas for solving growth-related problems, including transportation-related issues.

Both the MAGIC area and the I-495 Corridor communities are confronting the issue of suburb-to-suburb commuting, which is becoming more intense as job growth continues. The densities of suburban locations, particularly those in which new office/R&D development is taking place, are generally too low to allow them to be served effectively by traditional transit services. Older, more concentrated "downtowns," such as those in Lexington, Concord and Maynard, have typically lent themselves more readily to limited traditional fixed transit services, for work, shopping, personal business, and other such trips, than have historically rural communities such as Stow, Acton and Carlisle. But in the past, such downtown centers typically have had large nearby resident populations with relatively low auto availability, whose travel needs were essentially local—characteristics which no longer apply even in these areas, except for elderly citizens, school-age children, and people with disabilities. These are the primary markets served by existing transit-like services in these communities.

Control of development rests primarily in the hands of local officials, not state government. When large-scale expansion occurs on the scale of that currently being pursued by Littleton, Boxborough, and other towns along I-495, the state is virtually powerless to prevent such development, and so are regional agencies, particularly when such developments represent policies adopted by town governments.[7] The most influence the state can wield is through the MEPA review process, which requires impact statements to be filed for major projects and impact mitigation to be provided by developers. Mitigation usually includes improvements to local roadways, which can be incorporated by builders during site construction. It may also include participation in Transportation Management Associations (TMAs) or provision of ride-sharing or transit assistance by employers to commuters to and from the sites. TMA participation and commuting assistance may be included in mitigation agreements in good faith; however, they usually can only be implemented once construction is completed and developments are occupied, often by companies which are not bound by the agreements made by developers. In addition, there is no continuing and effective instrument of enforcing these requirements available to state transportation agencies. Hence, they generally are observed only sporadically and with limited investment by employers who themselves perceive no need for them.

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[7] E.g., the Tri-Town study of 1983 (*Preliminary Corridor Study, Middlesex Turnpike & Route 62, Billerica, Bedford & Burlington, MA, Summary Report*, prepared for the North Suburban Chamber of Commerce and the Towns of Billerica, Bedford and Burlington, MA, by Vanasse/Hangen Associates, May 1983). This report effectively created an overall plan for industrial development in the Middlesex Turnpike corridor. Also, the sites where Cisco is developing in Boxborough and Littleton were approved and permitted by these towns before Cisco appeared as a potential occupant.

Local communities have not had a great deal more success in holding developers to mitigation requirements which are intended to be long-term commitments. Again, this is because developers—the usual builders' agents involved in site plan approval processes—tend to disappear once approvals are granted; and the TDM initiatives they may have agreed to tend to receive *pro forma* compliance (if that) once the sites are actually occupied. The strongest influence communities can exert on these developments during the approvals process, in fact, is prescribed limitations on their size, location, and allowed access and numbers of parking spaces. Barring ability or desire to impose such restrictions, the best alternative open to communities is to exact monetary "impact fees" directly from developers, perhaps directly in exchange for relaxation of limitations on square footage and/or allowed parking. Such fees can then be used for whatever mitigation the local community deems appropriate, including shuttle services to and from the employer.

Additional information defining the upper limits of potential development within the MAGIC communities and elsewhere can be found in the "build-out" analyses recently conducted as part of EOEA's Community Preservation Program. These analyses identify all buildable land within each community, and the potential impacts associated with developing *all* such land to the maximum extent possible in accordance with its current zoning. While such analysis obviously represents a "worst-case scenario" for any community in terms of demands on community services, it presents an interesting benchmark against which more desirable types and rates of development may be compared.

3. RECENT TRENDS: TRANSPORTATION

3.1 Census Data

At this writing, the release of year 2000 Census data related to detailed commuting behavior is still six months to a year away. As dated as it is, the 1990 Census is still the only comprehensive source of detailed information about commuting behavior at the town and subtown levels. It was the primary data source for the *Suburban Public Transportation* paper[8], which used Journey-to-Work data as the basis of maps showing the distribution of employee origins throughout the metropolitan Boston region, including the origins of people who work in the Waltham/Route 128 and Burlington areas. While any analysis drawn from this data needs to be tempered by the recognition that the economic and employment scenes have changed since 1990, such analysis can at least represent a benchmark against which more recent data can be compared when available.

In the past, the MAGIC communities were largely residential suburbs of Boston. Work trips from the more easterly towns were mainly oriented towards the urban core areas of Boston and Cambridge, while the more westerly towns remained in agricultural uses or undeveloped. In the 1970s and 1980s, many work trips shifted toward the I-95/Route 128 belt as industrial expansion occurred where vacant land and roadway capacity were available. The Route 128 corridor is essentially built out at present, with most new growth associated with infill. Congestion on Route I-95/128 has also become chronic in the intervening years, with little support for increased capacity. In the MAGIC subregion and elsewhere, the I-495 corridor is emerging as the new locus of rapid, large-scale industrial and commercial development for the same reasons that made Route 128 attractive in earlier years.

Table 3-1 summarizes, at the town level, the numbers of home-to-work trips by mode originating at MAGIC-area residences, as recorded by the 1990 Census. **Table 3-2** shows the number of work trips destined for employment sites within MAGIC, also from 1990 Census data. The total number of such trips destined to work sites within MAGIC greatly exceeds (by about 50 percent) the number of work trips originating at MAGIC residences. This is most notable in the towns of Bedford, Concord, Lexington and Littleton, where large employers attract many workers from beyond the town borders. As with all suburban areas, the preponderance of drive-alone automobile work trips is noted in both tabulations. Carpooling is the second most popular mode within MAGIC, with the great majority of carpools containing two persons.

Surprisingly, the third most popular mode is "work-at-home," exceeding even the numbers of bus/commuter rail trips combined. Furthermore, the numbers of "work-at-home" commuters identified in 2000 is likely to have increased considerably since 1990, because of the more general availability of computer networking and the Internet which facilitate telecommuting as an alternative to traveling to work. One large MAGIC-area company interviewed cited "telecommuting" as the most popular and successful

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[8] Falbel, Stephen et al., *Suburban Public Transportation*, Central Transportation Planning Staff, August 1998.

TABLE 3-1
1990 Census: Work Trips by Mode and Town of Residence

Town	Total Trips	Drive Alone	Carpool (2+)	Bus/ Subway	Commuter Rail	Bike/ Motorcycle	Walk to Work	Work at Home	Other
Acton	10089	8500	761	42	301	27	150	241	67
		84%	8%	0%	3%	0%	2%	2%	1%
Bedford	6508	5223	543	152	0	41	298	227	24
		80%	8%	2%	0%	1%	5%	4%	0%
Bolton	1683	1372	119	0	39	0	49	90	14
		82%	7%	0%	2%	0%	3%	5%	1%
Boxborough	2007	1697	159	0	18	0	25	108	0
		85%	8%	0%	1%	0%	1%	5%	0%
Carlisle	2365	1911	179	7	22	0	12	234	0
		81%	8%	0%	1%	0%	1%	10%	0%
Concord	8071	6093	617	74	361	53	304	525	44
		76%	8%	1%	5%	1%	4%	7%	1%
Hudson	9537	7903	1145	27	29	23	191	173	46
		83%	12%	0%	0%	0%	2%	2%	1%
Lexington	12447	9973	952	523	25	54	280	550	90
		80%	8%	4%	0%	0%	2%	4%	1%
Littleton	3779	3282	244	19	77	20	52	85	0
		87%	7%	1%	2%	1%	1%	2%	0%
Lincoln	3921	2865	429	42	93	42	144	262	44
		73%	11%	1%	2%	1%	4%	7%	1%
Maynard	5150	4212	500	31	42	25	168	142	30
		82%	10%	1%	1%	1%	3%	3%	1%
Stow	2939	2413	204	12	71	8	54	163	14
		82%	7%	0%	2%	0%	2%	6%	1%
OVERALL	68496	55444	5852	929	1078	293	1727	2800	373
		81%	9%	1%	2%	0%	3%	4%	1%

Note: percent totals may not add to 100 because of rounding.

TABLE 3-2
1990 Census: Work Trips by Mode and Workplace Town

Town	Total Trips	Drive Alone	Carpool (2+)	Bus/ Subway	Commuter Rail	Bike/ Motorcycle	Walk to Work	Work at Home	Other
Acton	9941	8450	1029	0	12	26	167	241	16
		85%	10%	0%	0%	0%	2%	2%	0%
Bedford	25099	20850	3295	138	0	151	388	227	50
		83%	13%	1%	0%	1%	2%	1%	0%
Bolton	1353	1095	100	0	15	4	49	90	0
		81%	7%	0%	1%	0%	4%	7%	0%
Boxborough	2664	2321	210	0	0	0	25	108	0
		87%	8%	0%	0%	0%	1%	4%	0%
Carlisle	1046	641	149	0	0	10	12	234	0
		61%	14%	0%	0%	1%	1%	22%	0%
Concord	13325	11206	1077	67	46	41	309	525	54
		84%	8%	1%	0%	0%	2%	4%	0%
Hudson	8558	7056	998	27	17	42	208	173	37
		82%	12%	0%	0%	1%	2%	2%	0%
Lexington	23622	20068	2101	324	10	68	303	651	97
		85%	9%	1%	0%	0%	1%	3%	0%
Littleton	6662	6101	361	47	6	16	22	85	24
		92%	5%	1%	0%	0%	0%	1%	0%
Lincoln	1611	1089	118	6	39	7	48	262	42
		68%	7%	0%	2%	0%	3%	16%	3%
Maynard	6135	5214	556	10	0	22	149	150	34
		85%	9%	0%	0%	0%	2%	2%	1%
Stow	3195	2573	273	43	0	3	111	163	29
		81%	9%	1%	0%	0%	4%	5%	1%
OVERALL	103211	86664	10267	662	145	390	1791	2909	383
		84%	10%	1%	0%	0%	2%	3%	0%

Note: percent totals may not add to 100 because of rounding.

of the commuting alternatives it offers to its own employees. Indeed, "work-at-home" may have the potential to surpass all forms of transit, including commuter rail, as a commuting alternative for persons from more affluent communities like those within MAGIC.

In 1990, automobile ownership in this region was high compared with the rest of the Boston region. As seen in **Table 3-3**, Stow, Bolton, Carlisle and Littleton, all essentially rural/residential communities, had the highest auto ownership levels per household within MAGIC, while Maynard and Hudson, both somewhat more urbanized communities, had the lowest levels. Perhaps more striking is the percentage of households in Maynard and Hudson that had no vehicles available: over 8 percent in each community; in contrast with Carlisle, Bolton, Boxborough and Lincoln, where less than 2 percent of households had no vehicles. The other side of these statistics is the fact that between 60 and 85 percent[9] of households in MAGIC communities had at least two available vehicles in 1990. Although a final comparison must await the release of localized 2000 Census data, the likelihood is that vehicle ownership has increased for all communities since 1990.

3.2 Roadways and Traffic

The principal focus of transportation planning attention within the MAGIC region has been Route 2, the major east-west corridor traversing the area. Route 2 was once intended to be developed as a limited-access highway, but years of effort have been invested in developing alternative concepts for this corridor. A selection of alternatives involving grade separation at various points along Route 2 was analyzed by CTPS during the early 1990s as part of a long-range corridor study. The section of Route 2 through Concord and Lincoln is now two travel lanes in each direction, with additional turning lanes at signalized intersections. A Jersey barrier has been installed in the median for part of the highway's length as a safety feature, and additional safety improvements are planned for the remaining sections. The signalized intersection of Route 2 and Route 2A on the Lincoln/Concord town line (Crosby's Corner) is scheduled to be replaced by a grade-separated connection in the near future.

As described in Section 1 above, CTPS continues to work with the Route 2 Citizens' Advisory Committee (CAC). The focus of current work is the definition and analysis of alternatives for improvements to the existing rotary at the western end of Route 2 in Concord, and to the at-grade signalized intersection at Route 111/Taylor Road in Acton. Also, the developer of the office property at 300 Baker Avenue has committed to provide traffic signal coordination for three Route 2 traffic signals in the vicinity of his project.

No major improvements have been proposed or advanced for I-95 in the MAGIC area (principally through Lexington), apart from installation of technology to facilitate camera surveillance and incident management. There is not likely to be much receptivity to the idea of adding capacity to I-95 in this area for some time. This section of I-95 experiences chronic congestion for a large segment of the day, generated by the intense industrial activity on both sides of the roadway in Waltham, Lexington and points north.

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[9] For Maynard and Carlisle, respectively.

On the northern boundary of the MAGIC area, traversing Bedford and Burlington, Route 3 serves commuters from the Greater Lowell and southern New Hampshire areas who are bound for the Boston core or the I-95 industrial belt. The project to widen Route 3, currently two travel lanes in each direction, to three lanes each way has been under study and design for the past 10 years. Construction on this project began in the spring of 2001.

TABLE 3-3
Vehicles per Capita Available to MAGIC Town Residents (1990 Census)

	Veh per household	Veh per capita	H'holds w/ no vehicles	% all households	H'holds w/ 1 vehicle	% all households
Acton	1.91	.70	243	3.7	1799	27.4
Bedford	1.95	.67	271	6.9	854	21.7
Bolton	2.27	.75	13	1.3	202	19.4
Boxborough	1.92	.77	13	1.0	446	33.1
Carlisle	2.28	.76	28	1.9	188	13.0
Concord	1.96	.65	282	5.0	1435	25.2
Hudson	1.81	.67	538	8.4	1779	27.9
Lexington	1.92	.70	365	5.6	1785	27.4
Lincoln	1.99	.68	6	0.2	704	27.0
Littleton	2.10	.74	130	5.2	582	23.2
Maynard	1.66	.66	250	8.0	998	31.9
Stow	2.21	.74	51	2.9	252	14.1
Total MAGIC	1.93	.69	2190	5.1	11024	25.7
Total Massachusetts		.53				

Source: CTPP Census Package, 1990, for MAGIC data; Falbel, Stephen, *The Demographics of Commuting in Greater Boston* 2nd edition rev. (CTPS, August 1998) for statewide.

I-495 is a limited-access expressway for its entire length, three lanes wide in each direction through the MAGIC towns of Hudson, Bolton, Boxborough and Littleton. The interchanges are partial cloverleaf interchanges[10] which until recent years have been more than adequate to serve demand. The constraint on the existing system is less the capacity of I-495 itself than the limitations of the feeder roads which intersect with it: typically two-lane roads designed to serve rural, low-traffic areas. These roads include (traveling north to south):

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[10] Full cloverleaf at interchanges with Routes 2 and I-290; partial elsewhere.

Route 119, Littleton
Route 2A/110, Littleton
Taylor Road at the Route 2 interchange, Littleton
Route 111, Boxborough
Route 117, Bolton
Connection to I-290/Route 85, Hudson

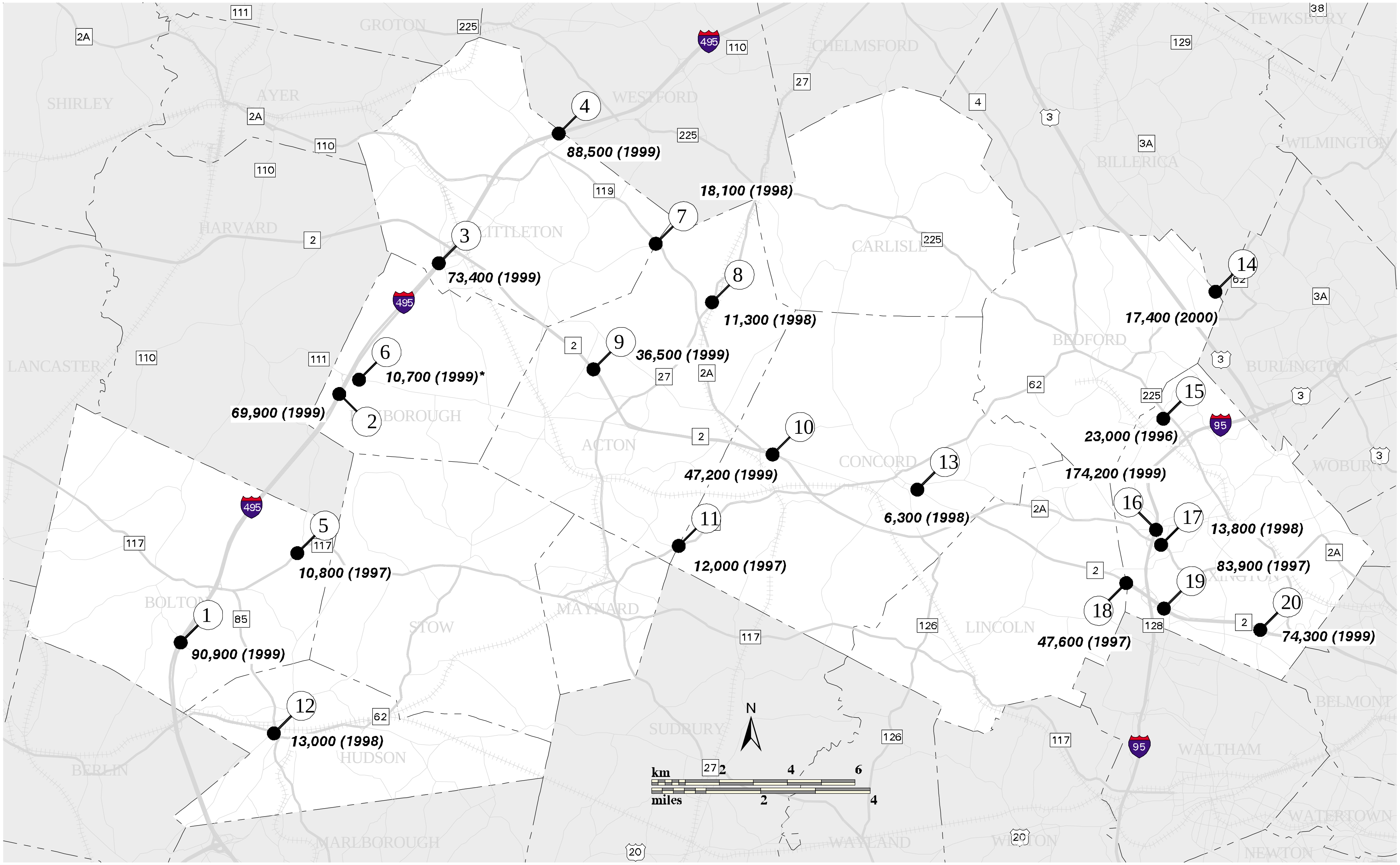
As described earlier, I-495 has in recent years emerged as the next industrial growth corridor, as a result of relocation of large corporate headquarters to adjacent undeveloped land.

An inventory was made of 24-hour traffic counts from MassHighway files, as well as from major consultant studies previously undertaken in the MAGIC towns plus nearby Burlington and Billerica. The objective was to identify locations, principally on major roadways or numbered routes, where several years' worth of traffic count data could be compiled and compared, in order to observe growth patterns and trends on these roadways. **Figure 3-1** illustrates these locations, which include multiple points on Route 2 and I-495. **Appendix A** contains graphs illustrating daily variations in traffic over time, based on the collected volumes.

It is interesting to compare volumes on I-495 with those on I-95 (Route 128). The graphs for both roadways are presented on scales which correspond to the approximate hourly capacity for three- and four-lane expressways respectively (i.e., 6,000 and 8,000 vehicles per hour). The graphs show that I-95 is at or close to capacity for several hours per day, while I-495 still operates within capacity, although traffic volumes have shown steady growth. Both highways exhibit commuter peaking, although the hours of the afternoon peak on I-95 are broadening. Neither highway is strongly directional during the commuter peaks, in contrast to, for example, Route 2A in Acton, which carries predominantly southbound traffic in the morning peak period. Compared with Route 2A, Route 111 in Boxborough to this point has carried low volumes of predominantly local traffic, without strong peaking or directionality.

3.3 Analysis of Origins for Selected Links

Because the most recent Census data documenting work-trip origins and destinations still dates from 1990, a different method was used to develop some understanding of the composition of traffic on major roadways in the MAGIC area. The count locations described above were analyzed to identify the sources of the traffic using each specific roadway link. This was accomplished by running an assignment of the regional traffic model, with a separate trip table requested as output for each of the links representing these count locations. Both directions of travel were analyzed at each location. While it is not possible to identify which is the home end and which the activity end for these trips, a general sense of the principal two-way trips served by each roadway at each location can be obtained from this two-direction analysis.



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●—② ***= count location***

ADT Volume (Date)

** identifies non-MHD count*

(Source: CTPS GIS/MassHighway)

Figure 3-1

Historic Traffic Count Locations

A total of 20 locations were selected for analysis, based on the traffic count locations shown in **Figure 3-1,** for which data is available in multiple years. At 13 of the 20 locations, the calibrated results were good (within 10 percent) to excellent (less than 5 percent difference). Three locations (Routes 2 and Route 2A in Acton, and Route 62 in Hudson) were discarded because of poor matches between counted and calibrated volumes. The remainder of locations calibrated moderately well with the observed counts.[11]

The data for different count stations were assembled into groups representing broad areas or "super-zones," as shown in **Figure 3-2**. The trip origins by "super-zone" representing each count location are presented in **Figures 3-3** to **3-6,** with the caution that the breakdowns shown are derived only from model runs which purport to replicate count volumes, and which have varying degrees of success at achieving that objective. They are *NOT* derived from surveys of any kind, which might provide more reliable information but at a cost and scale of effort which is beyond the present study.

Figure 3-3 shows a breakdown for I-495, summarizing model results at three locations for origins contributing 3 percent or more to assigned traffic. It is obvious that New Hampshire and the Massachusetts towns close to the New Hampshire border are important sources for I-495 traffic, and will continue to be in the future. As far south as Bolton, half of the southbound traffic assigned to I-495 is from these two sources. Also important are the towns through which I-495 runs, and those located just to the west.

Much less noticeable contributors to I-495 traffic are other MAGIC towns: the only non-abutting contributor town in the southbound direction is Acton, while the only non-abutting contributor to northbound traffic is Stow. MetroWest area origin towns do contribute a large share of northbound traffic on I-495. The assignment procedure added these trips to I-495 south of Bolton, however. The model did not divert traffic to "cut-through" routes through Hudson, Bolton or Stow: one reasonable interpretation is that the only plausible alternative is Route 85, a signalized arterial with urban characteristics through much of Marlborough and Hudson, which is a relatively unattractive route compared with I-495 in this area.

A second map (**Figure 3-4**) shows analysis of traffic origins at three count locations on Route 2. The overwhelming dominance of the Boston Core area[12] for westbound travel is suggestive of the importance of that area as the location of employment sites for MAGIC residents. It is followed by the I-95 (Route 128) South area, the I-93 corridor towns (including Somerville, Medford, Malden, Stoneham and Winchester), and Waltham. In the other direction, Route 2 successively picks up traffic from Acton, Concord and Lincoln as it passes through each of these towns, and slightly over one-

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[11] It is worth pointing out that the primary goal in carrying out a travel model calibration is to achieve excellent calibration levels on major roadways carrying heavy volumes. It is difficult, if not impossible, to insure that similar matches can be obtained on more minor roadways. This is generally quite acceptable, as long as the absolute value of the differences between counted and estimated volumes is not greater than about 10 percent.

[12] Defined for this study to comprise the cities/towns of Boston, Cambridge, Brookline, Belmont, Arlington and Watertown.

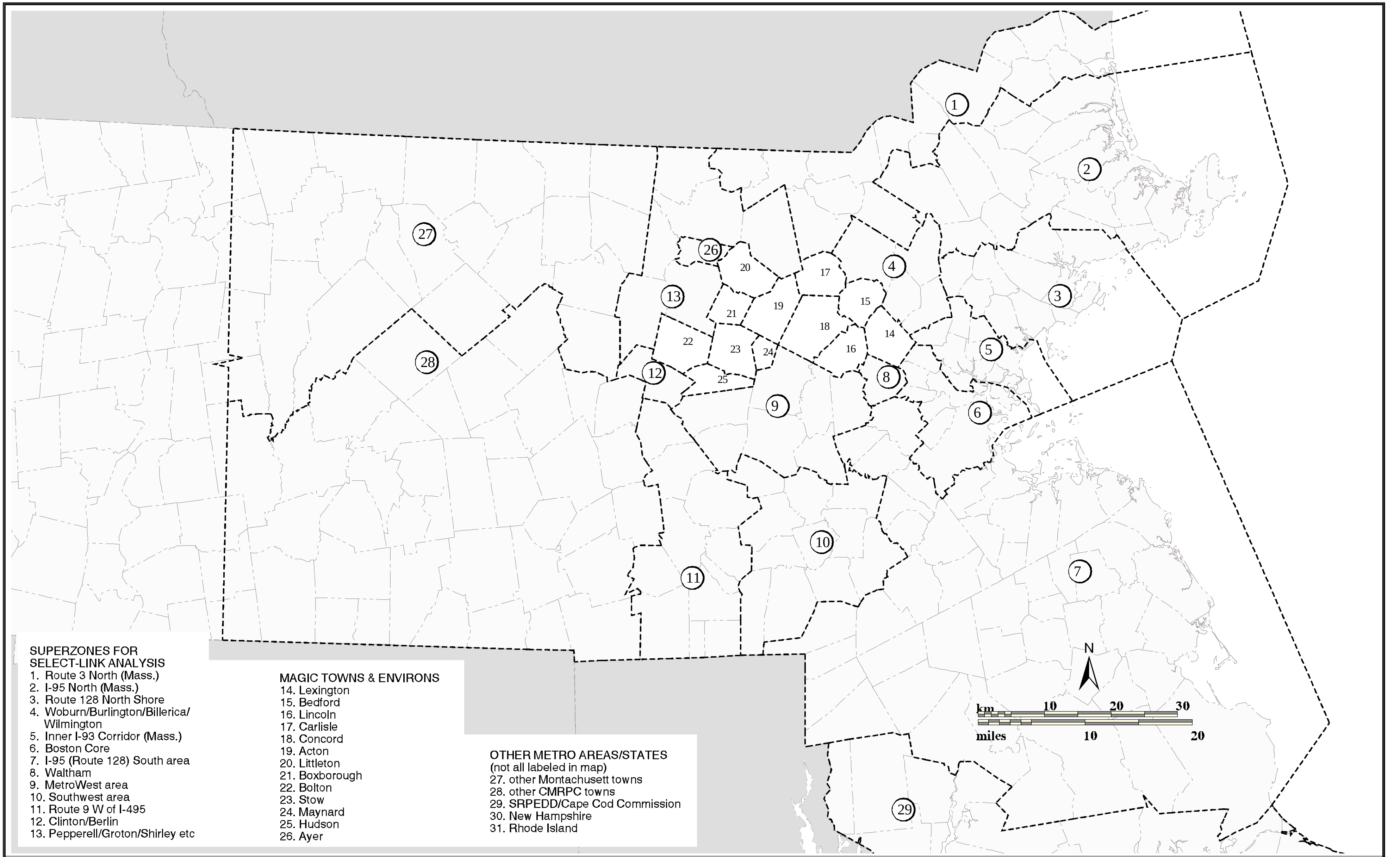

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Figure 3-2

Super-Zones Defined for Select-Link Analysis

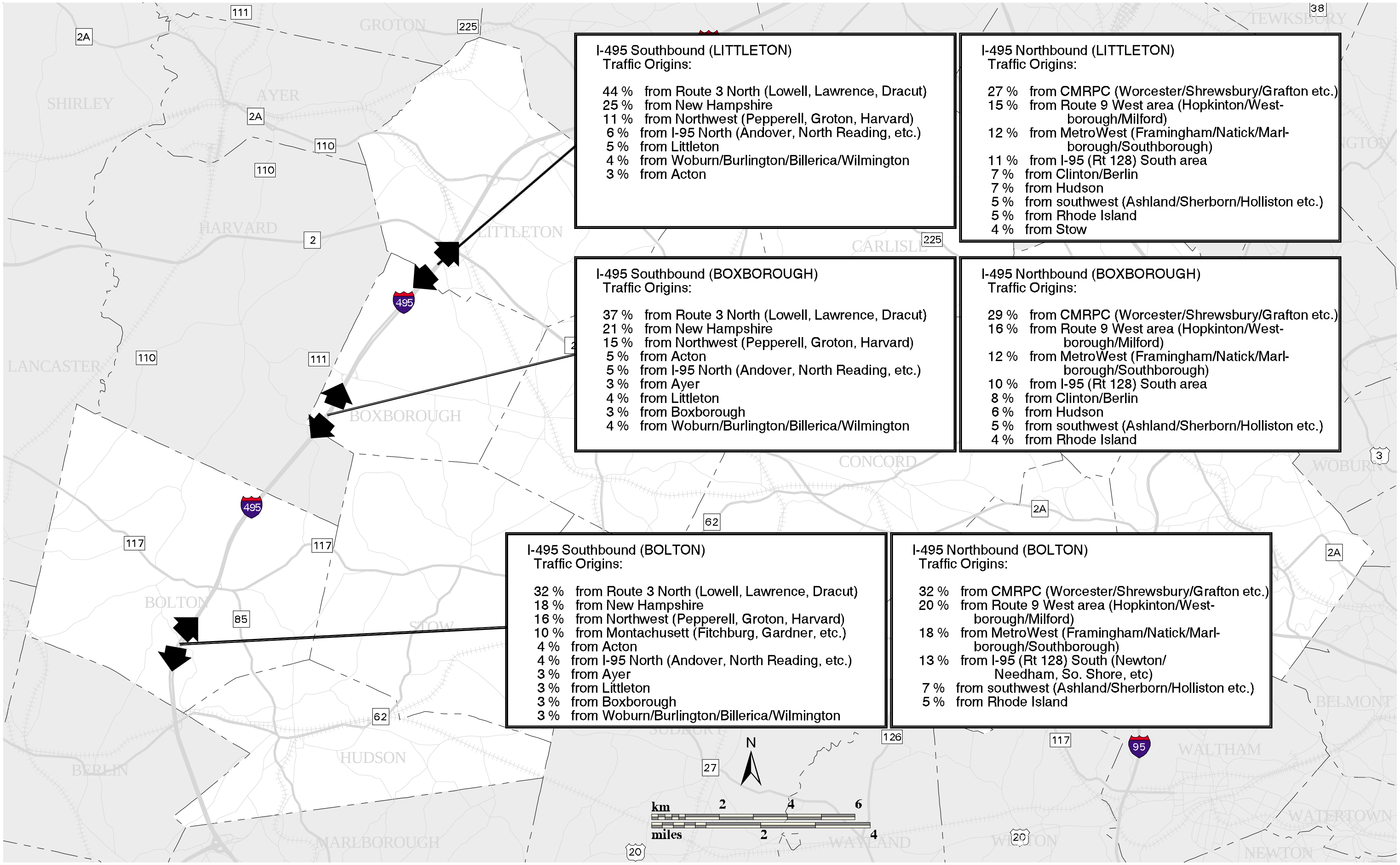
February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-20zon.aml third of eastbound traffic on Route 2 in Lincoln originates in towns west and northwest of MAGIC.

East of I-95 (Route 128), Route 2's traffic-carrying capacity is twice what it is to the west, and volumes are almost twice as high. The proportion of traffic originating in Concord and Acton has shrunk more than half, partly because of the higher base volumes, but also because of the high levels of traffic interchange between Route 2 and I-95. The traffic added to Route 2 Eastbound at this location, much of it probably coming from Route 128, has origins in Bedford, Waltham, towns along Route 3 North and Lexington itself.

A third grouping of analyzed links included several roadways close to the eastern edge of MAGIC: I-95 (Route 128) and Route 2A in Lexington, and the Middlesex Turnpike in Bedford (illustrated in **Figure 3-5**). Of these, the most interesting results are probably those for I-95 (Route 128), which carries by far the highest traffic volumes within the MAGIC subregion. The broad distribution of origins of Route 128 traffic suggests the extent to which the road serves region-wide demands: e.g., substantial fractions of traffic from the area south of Waltham and Waltham itself, traffic from MetroWest and from the cities/towns included in the Boston Core for this analysis. Concord and Lexington are the only towns besides Waltham contributing significant northbound volume in these assignment results: Waltham probably represents trip "work ends" for these trips; Concord and Lexington may represent either "home ends" or "work ends."

On the Middlesex Turnpike north of Route 62, most of the westbound volume assigned by the model originated in Bedford, and likely represents work trips from Bedford residences to the industrial facilities along the Turnpike.

Finally, the three count locations on local arterials serve mainly trips having one end within MAGIC, as one might expect (**Figure 3-6**). Volumes on Route 62, for example, are influenced primarily by activity in Concord and Maynard, and represent trips back and forth between these two towns as well as between Maynard and Route 2. Volumes on Route 111 in Boxborough are dominated by residents of MAGIC towns and people who come to MAGIC towns to work or shop, or for other purposes, rather than through traffic. Only at the Cambridge Turnpike location in Concord does a dominant percentage of trips represent work trips by local residents (mainly Concord) to the Boston Core and the Route 128 employment centers. The model also assigns trips at this location to origins in Carlisle and the towns along the Route 3 corridor, suggesting that this is, indeed, a desirable alternative route for such trips compared with, for example, Route 4/225.



I-495 Southbound (LITTLETON)
Traffic Origins:

44 %	from Route 3 North (Lowell, Lawrence, Dracut)
25 %	from New Hampshire
11 %	from Northwest (Pepperell, Groton, Harvard)
6 %	from I-95 North (Andover, North Reading, etc.)
5 %	from Littleton
4 %	from Woburn/Burlington/Billerica/Wilmington
3 %	from Acton

I-495 Northbound (LITTLETON)
Traffic Origins:

27 %	from CMRPC (Worcester/Shrewsbury/Grafton etc.)
15 %	from Route 9 West area (Hopkinton/Westborough/Milford)
12 %	from MetroWest (Framingham/Natick/Marlborough/Southborough)
11 %	from I-95 (Rt 128) South area
7 %	from Clinton/Berlin
7 %	from Hudson
5 %	from southwest (Ashland/Sherborn/Holliston etc.)
5 %	from Rhode Island
4 %	from Stow

I-495 Southbound (BOXBOROUGH)
Traffic Origins:

37 %	from Route 3 North (Lowell, Lawrence, Dracut)
21 %	from New Hampshire
15 %	from Northwest (Pepperell, Groton, Harvard)
5 %	from Acton
5 %	from I-95 North (Andover, North Reading, etc.)
3 %	from Ayer
4 %	from Littleton
3 %	from Boxborough
4 %	from Woburn/Burlington/Billerica/Wilmington

I-495 Northbound (BOXBOROUGH)
Traffic Origins:

29 %	from CMRPC (Worcester/Shrewsbury/Grafton etc.)
16 %	from Route 9 West area (Hopkinton/Westborough/Milford)
12 %	from MetroWest (Framingham/Natick/Marlborough/Southborough)
10 %	from I-95 (Rt 128) South area
8 %	from Clinton/Berlin
6 %	from Hudson
5 %	from southwest (Ashland/Sherborn/Holliston etc.)
4 %	from Rhode Island

I-495 Southbound (BOLTON)
Traffic Origins:

32 %	from Route 3 North (Lowell, Lawrence, Dracut)
18 %	from New Hampshire
16 %	from Northwest (Pepperell, Groton, Harvard)
10 %	from Montachusett (Fitchburg, Gardner, etc.)
4 %	from Acton
4 %	from I-95 North (Andover, North Reading, etc.)
3 %	from Ayer
3 %	from Littleton
3 %	from Boxborough
3 %	from Woburn/Burlington/Billerica/Wilmington

I-495 Northbound (BOLTON)
Traffic Origins:

32 %	from CMRPC (Worcester/Shrewsbury/Grafton etc.)
20 %	from Route 9 West area (Hopkinton/Westborough/Milford)
18 %	from MetroWest (Framingham/Natick/Marlborough/Southborough)
13 %	from I-95 (Rt 128) South (Newton/Needham, So. Shore, etc)
7 %	from southwest (Ashland/Sherborn/Holliston etc.)
5 %	from Rhode Island

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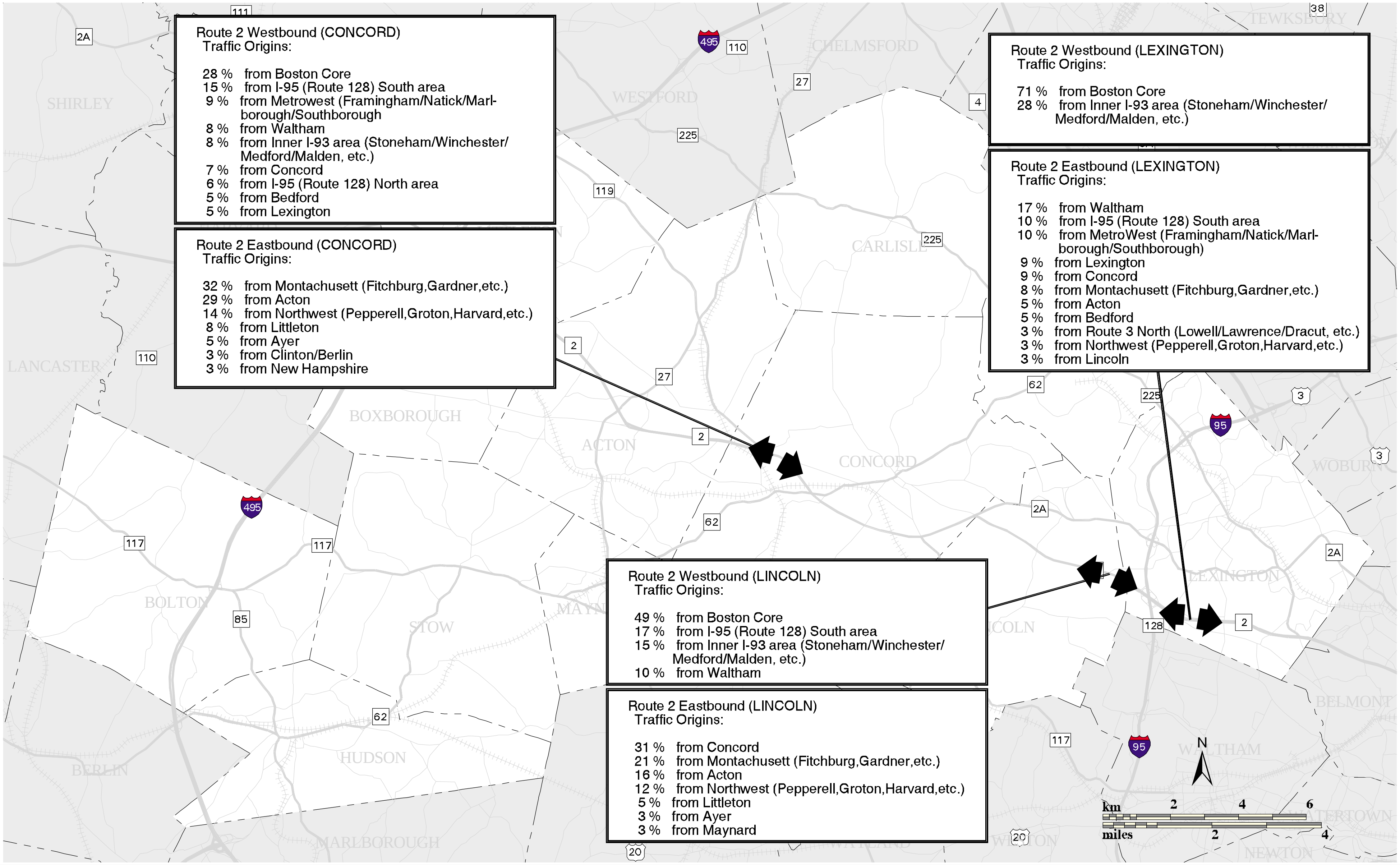
⬆ **Link Location**

NOTE: based on CTPS model runs

Figure 3-3
**Select-Link Analysis--
Count Locations on I-495**

February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-16sel.aml



Route 2 Westbound (CONCORD)
Traffic Origins:

- 28 % from Boston Core
- 15 % from I-95 (Route 128) South area
- 9 % from Metrowest (Framingham/Natick/Marlborough/Southborough
- 8 % from Waltham
- 8 % from Inner I-93 area (Stoneham/Winchester/Medford/Malden, etc.)
- 7 % from Concord
- 6 % from I-95 (Route 128) North area
- 5 % from Bedford
- 5 % from Lexington

Route 2 Eastbound (CONCORD)
Traffic Origins:

- 32 % from Montachusett (Fitchburg,Gardner,etc.)
- 29 % from Acton
- 14 % from Northwest (Pepperell,Groton,Harvard,etc.)
- 8 % from Littleton
- 5 % from Ayer
- 3 % from Clinton/Berlin
- 3 % from New Hampshire

Route 2 Westbound (LEXINGTON)
Traffic Origins:

- 71 % from Boston Core
- 28 % from Inner I-93 area (Stoneham/Winchester/Medford/Malden, etc.)

Route 2 Eastbound (LEXINGTON)
Traffic Origins:

- 17 % from Waltham
- 10 % from I-95 (Route 128) South area
- 10 % from MetroWest (Framingham/Natick/Marlborough/Southborough)
- 9 % from Lexington
- 9 % from Concord
- 8 % from Montachusett (Fitchburg,Gardner,etc.)
- 5 % from Acton
- 5 % from Bedford
- 3 % from Route 3 North (Lowell/Lawrence/Dracut, etc.)
- 3 % from Northwest (Pepperell,Groton,Harvard,etc.)
- 3 % from Lincoln

Route 2 Westbound (LINCOLN)
Traffic Origins:

- 49 % from Boston Core
- 17 % from I-95 (Route 128) South area
- 15 % from Inner I-93 area (Stoneham/Winchester/Medford/Malden, etc.)
- 10 % from Waltham

Route 2 Eastbound (LINCOLN)
Traffic Origins:

- 31 % from Concord
- 21 % from Montachusett (Fitchburg,Gardner,etc.)
- 16 % from Acton
- 12 % from Northwest (Pepperell,Groton,Harvard,etc.)
- 5 % from Littleton
- 3 % from Ayer
- 3 % from Maynard

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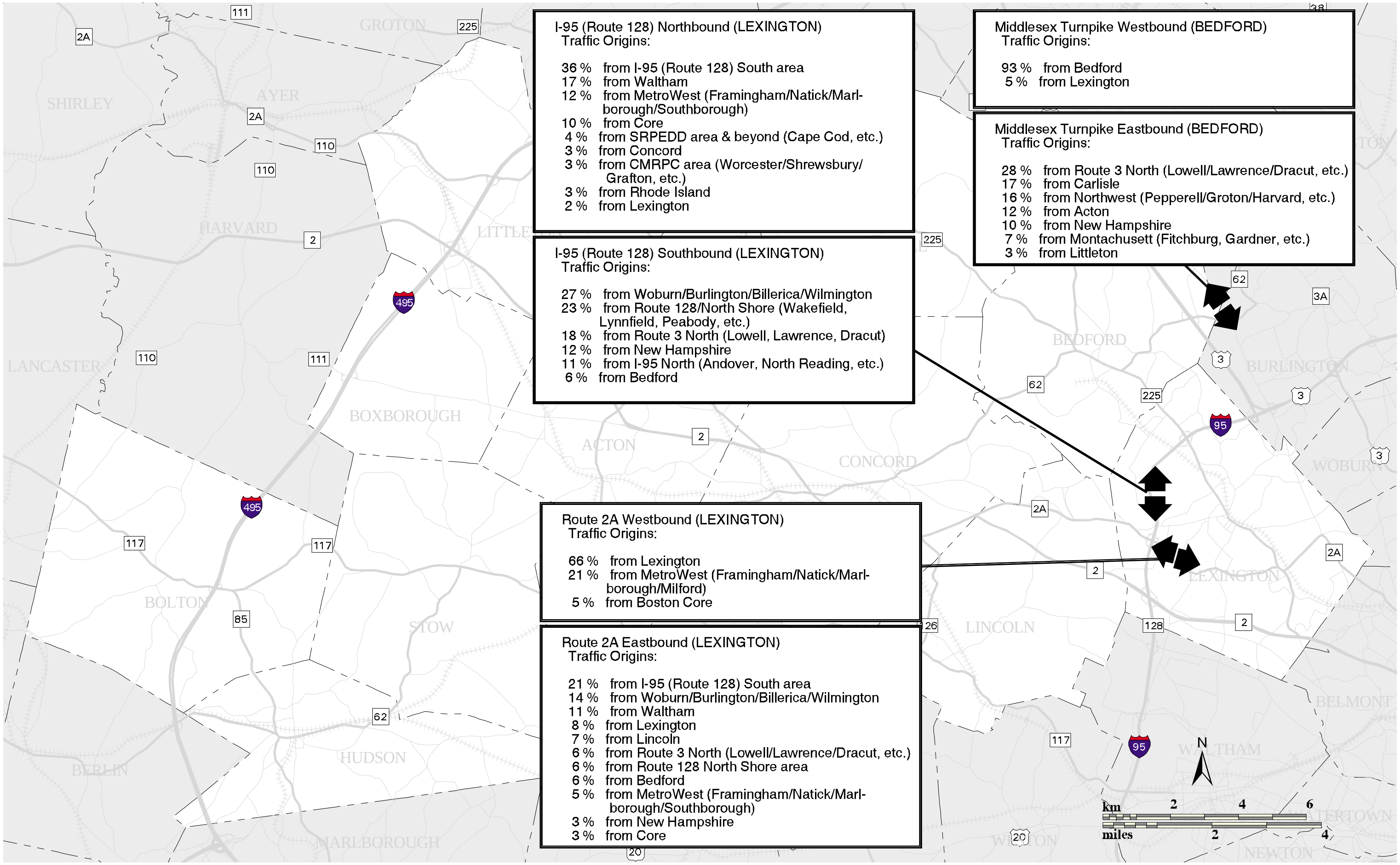
Link Location

NOTE: based on CTPS model runs

Figure 3-4
Select-Link Analysis--
Count Locations on Route 2

February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-17sel.aml



I-95 (Route 128) Northbound (LEXINGTON)
Traffic Origins:

36 % from I-95 (Route 128) South area
17 % from Waltham
12 % from MetroWest (Framingham/Natick/Marlborough/Southborough)
10 % from Core
4 % from SRPEDD area & beyond (Cape Cod, etc.)
3 % from Concord
3 % from CMRPC area (Worcester/Shrewsbury/Grafton, etc.)
3 % from Rhode Island
2 % from Lexington

I-95 (Route 128) Southbound (LEXINGTON)
Traffic Origins:

27 % from Woburn/Burlington/Billerica/Wilmington
23 % from Route 128/North Shore (Wakefield, Lynnfield, Peabody, etc.)
18 % from Route 3 North (Lowell, Lawrence, Dracut)
12 % from New Hampshire
11 % from I-95 North (Andover, North Reading, etc.)
6 % from Bedford

Middlesex Turnpike Westbound (BEDFORD)
Traffic Origins:

93 % from Bedford
5 % from Lexington

Middlesex Turnpike Eastbound (BEDFORD)
Traffic Origins:

28 % from Route 3 North (Lowell/Lawrence/Dracut, etc.)
17 % from Carlisle
16 % from Northwest (Pepperell/Groton/Harvard, etc.)
12 % from Acton
10 % from New Hampshire
7 % from Montachusett (Fitchburg, Gardner, etc.)
3 % from Littleton

Route 2A Westbound (LEXINGTON)
Traffic Origins:

66 % from Lexington
21 % from MetroWest (Framingham/Natick/Marlborough/Milford)
5 % from Boston Core

Route 2A Eastbound (LEXINGTON)
Traffic Origins:

21 % from I-95 (Route 128) South area
14 % from Woburn/Burlington/Billerica/Wilmington
11 % from Waltham
8 % from Lexington
7 % from Lincoln
6 % from Route 3 North (Lowell/Lawrence/Dracut, etc.)
6 % from Route 128 North Shore area
6 % from Bedford
5 % from MetroWest (Framingham/Natick/Marlborough/Southborough)
3 % from New Hampshire
3 % from Core

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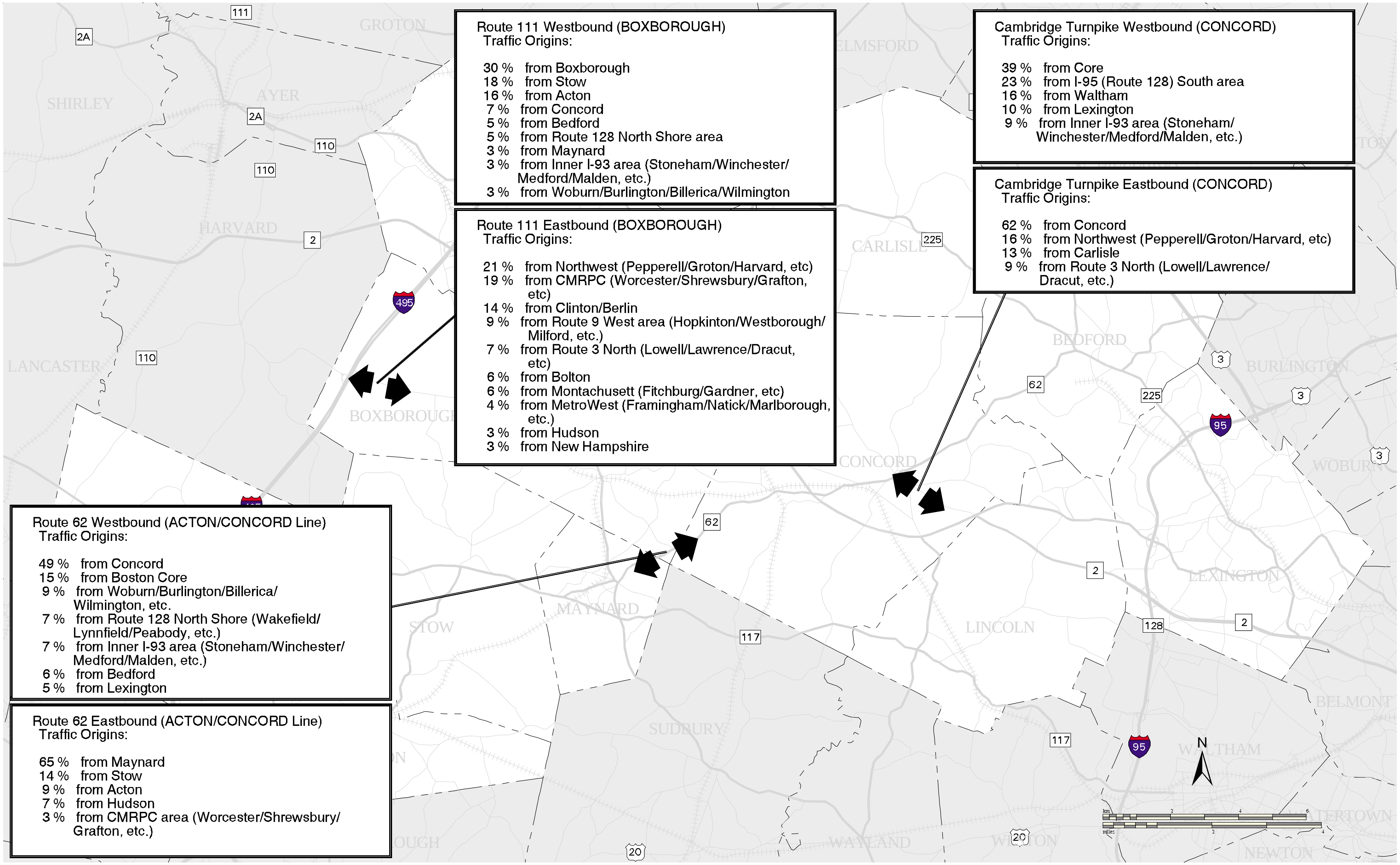
⬆ **Link Location**

NOTE: based on CTPS model runs

Figure 3-5
Select-Link Analysis--
Other Count Locations (East)



Route 111 Westbound (BOXBOROUGH)
Traffic Origins:

30 % from Boxborough
18 % from Stow
16 % from Acton
7 % from Concord
5 % from Bedford
5 % from Route 128 North Shore area
3 % from Maynard
3 % from Inner I-93 area (Stoneham/Winchester/Medford/Malden, etc.)
3 % from Woburn/Burlington/Billerica/Wilmington

Route 111 Eastbound (BOXBOROUGH)
Traffic Origins:

21 % from Northwest (Pepperell/Groton/Harvard, etc)
19 % from CMRPC (Worcester/Shrewsbury/Grafton, etc)
14 % from Clinton/Berlin
9 % from Route 9 West area (Hopkinton/Westborough/Milford, etc.)
7 % from Route 3 North (Lowell/Lawrence/Dracut, etc)
6 % from Bolton
6 % from Montachusett (Fitchburg/Gardner, etc)
4 % from MetroWest (Framingham/Natick/Marlborough, etc.)
3 % from Hudson
3 % from New Hampshire

Cambridge Turnpike Westbound (CONCORD)
Traffic Origins:

39 % from Core
23 % from I-95 (Route 128) South area
16 % from Waltham
10 % from Lexington
9 % from Inner I-93 area (Stoneham/Winchester/Medford/Malden, etc.)

Cambridge Turnpike Eastbound (CONCORD)
Traffic Origins:

62 % from Concord
16 % from Northwest (Pepperell/Groton/Harvard, etc)
13 % from Carlisle
9 % from Route 3 North (Lowell/Lawrence/Dracut, etc.)

Route 62 Westbound (ACTON/CONCORD Line)
Traffic Origins:

49 % from Concord
15 % from Boston Core
9 % from Woburn/Burlington/Billerica/Wilmington, etc.
7 % from Route 128 North Shore (Wakefield/Lynnfield/Peabody, etc.)
7 % from Inner I-93 area (Stoneham/Winchester/Medford/Malden, etc.)
6 % from Bedford
5 % from Lexington

Route 62 Eastbound (ACTON/CONCORD Line)
Traffic Origins:

65 % from Maynard
14 % from Stow
9 % from Acton
7 % from Hudson
3 % from CMRPC area (Worcester/Shrewsbury/Grafton, etc.)

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Link Location

NOTE: based on CTPS model runs

Figure 3-6
Select-Link Analysis-- Other Count Locations (Central)

3.4 Currently Operating Transit/Paratransit Services

Table 3-4 summarizes the variety of transit and paratransit services currently available to residents and employees within different towns in MAGIC.

(1) Commuter Rail

The Fitchburg commuter rail line is the principal transit route serving MAGIC commuters destined for downtown Boston and intermediate stations in Waltham and Cambridge. The Fitchburg Line has two tracks between Boston and South Acton; from South Acton westward, service operates on a single track. Four AM peak-period trips depart daily from Fitchburg beginning at 5:45 AM, with a fifth trip starting from South Acton at 8:41 AM. All trips stop at Waltham and Cambridge (Porter Square), but the 6:55 AM trip skips local stops in Weston, Waltham and Belmont.

The existing service is primarily oriented toward Boston core-bound commuters; but there is a great deal of interest among MAGIC communities in the potential for reverse-commuting on the Fitchburg Line. Only limited service is available in the reverse-peak direction (2 outbound AM peak-period trips from Boston to South Acton, and 3 inbound PM peak-period trips, also from South Acton). The recent CTPS reverse-commute study, prepared for the MBTA, documents in great detail the constraints and costs associated with trying to reconfigure this line to provide additional service in the off-peak direction.[13]

The main limitation of the existing service is the severe parking shortages which afflict all stations on the Fitchburg Line. There are only 1,075 spaces identified on the MBTA's web site for the entire line (see **Table 3-5**). The largest parking area, at South Acton, is also located at the farthest origin station served by the last AM peak-period train. There are a total of 293 parking spaces at South Acton, but overflow parking can be seen on adjacent streets and unpaved areas.

There is resistance to the provision of additional commuter rail parking within several of the towns along the line, particularly Acton and Concord. However, the MAGIC towns are generally in support of the idea of a new regional station with large parking capacity, located on the outer edge of the MAGIC subregion. Residents of Littleton have proposed a new train station to replace the existing Littleton station; their preferred site is an environmentally sensitive parcel of land adjacent to Route 2 on the Littleton-Boxborough town line. This idea is supported by other towns, notably Acton and Concord: for these towns, it represents a preferable alternative to parking expansions within their own borders. A new interchange connection to Route 2 would be required to serve a train station at this location.

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[13] Humphrey, Thomas J., "MBTA Reverse Commuting Study," CTPS Draft Report, May 2001.

TABLE 3-4
MAGIC Area Transit/Paratransit Services
(Spring 2001)

SERVICE PROVIDER	SERVICE/ROUTE	DAILY RIDERSHIP*	FUNDING
MBTA commuter rail	**Fitchburg Line** : stations at Littleton/I-495, South Acton, West Concord, Concord, Lincoln **Lowell Line** : station and park-ride lot at Mishawum—relocated to Anderson/Woburn April 28, 2001	S. Acton: 496 on inbound; 8 off inbound 1 on outbound; 34 off outbound (count, 1/9/01, 6:15-9:45 am) Mishawum: 275 on inbound; 24 off inbound 25 on outbound; 90 off outbound (count, 12/5/00, 6-9 am)	MBTA service
MBTA bus service	**Route 62**: Bedford VA Hospital via Lexington Center to Alewife **Route 76**: Hanscom AFB via Lexington Center to Alewife (62 & 76 combined on Saturdays) **Route 350:** Burlington to Alewife via Burlington Mall (doesn't stop within MAGIC, but transfers possible at Mall) **Route 351**: Oak Park via Burlington Mall to Alewife. Serves Crosby Drive as well as Oak Park area **Route 352**: Burlington to Haymarket/Government Center (doesn't stop within MAGIC, but connections possible from other bus routes at Burlington Mall Rd) **Route 170**: Dudley to Crosby Drive	Rt 62: 582 inbound on; 611 outbound on (Fall '98 ride-check) Rt 76: 426 inbound on; 432 outbound on (Fall '98 ride-check) Rt 350: 698 inbound on; 839 outbound on (Spring '99 ride-check) Rt 351: 61 inbound on; 81 outbound on (Spring '99 ride-check) Rt 352: 252 inbound on; 258 outbound (Spring '99 ride-check) Rt 170: 21 on inbound; 29 outbound (1 inbound, 2 outbound trips) (Sept '00 ride-check)	MBTA service

Table 3-4 (cont’d)

LRTA bus service	**Route 19**: Gallagher Terminal, Lowell to Billerica/Burlington industrial areas and Lahey Clinic/Burlington Mall. Serves Crosby Drive and Oak Park areas.	158 avg. daily riders (79 each way) (April ‘01) (data from LRTA: avg. daily estimated from monthly total)	LRTA service
Lexpress service, Lexington	**Route 1**: Depot Square-East Lexington via Pleasant/Taft/Bow **Route 2**: Depot Square-Lexington Ridge via Worthen/Follen/Waltham **Route 3**: Depot Square-Countryside & Emerson Garden Rd **Route 4**: Depot Square-School & Lincoln St **Route 5**: Depot Square-Malls via Grant St/ Middlesex Tpk **Route 6**: Depot Square-Diamond & Estabrook Schools	Avg. daily riders (Fall 2000 est.)**: Route 1: 62 Route 2: 93 Route 3: 52 Route 4: 59 Route 5: 63 Route 6: 104 System total: 432 riders/day Avg. riders per trip: 6.3	Subsidized through MBTA Suburban Transportation program and Town of Lexington
Burlington B-Line (included because of proximity to MAGIC)	6 routes serving Burlington Mall, Middlesex Turnpike, with connections to MBTA and LRTA services to Alewife and Gallagher Terminal	Avg. daily riders (Fall 2000 est.)**: Route 1: 51 Route 2 40 Route 3: 48 Route 4: 57 Route 5: 38 Route 6: 40 System total: 273 riders/day Avg. riders per trip: 4.4	Subsidized through MBTA Suburban Transportation program and Town of Burlington

Table 3-4 (cont'd)

Private-carrier bus service	**Yankee Bus:** One route, one commuter trip per day: Hoyt's Cinema (Route 2A, Acton) to Copley Square (Boston) via Concord Center **Gulbankian**: Hudson to Boston via Marlborough/Framingham MBTA: 4 round-trips per day	Yankee: 5 to 8 riders (2 boarding counts, Copley Square, May 2001) Gulbankian: 124 daily riders (62 each way) (almost all inbound on 2 morning peak trips) (Oct 2000)	(Leased bus supplied through State; otherwise not subsidized) Subsidized through MBTA Inter-District Transportation Service Program
Route 128 Business Council shuttles	**Routes 22/25** and **34** provide peak-period commuting service to member employer locations on Hayden Avenue and Spring Streets, Lexington: 7 outbound AM and 3 inbound PM trips per day	On all trips carried total of 324 total passengers per week, or 32.4 per day each way (week of 10/20/00); 479 total passengers, or 48 per day each way (week of 11/17/00) (Data provided by TMA)	Subsidized as TMA through MassHighway TDM program
Maynard-Rail Shuttle	(not yet open to non-Clock-Tower employees; contract currently out to bid, operated by Clock Tower Place with TDM grant)	AM peak service--all vans leaving South Acton: --carried 22 riders (19 from outbound trains, 3 from inbound trains) (1/9/01)	Subsidized through MassHighway TDM program
Concord Free Bus	One trip per day which loops through Concord commercial areas between 8:50 and 11:35 each day, then runs to one of two local supermarkets 3 days per week	No ridership information available.	Not subsidized by State
Bedford Local Transit	Demand-responsive service using 1 wheelchair-equipped van vehicle. Dispatch hours: 8-9 am daily. Service hours: 9-11:55 am and 1-2:55 pm, plus one noontime trip to Burlington Mall per day.	Avg. 26 riders per weekday (11/00) (Data provided by operator)	Subsidized through MBTA Suburban Transportation Program and Town of Bedford

*Ridership information derived from CTPS Transit Service Planning Group ride-check program results, except where noted.

**Estimated by factoring Fall 2000 total ridership figures, obtained from operators, to individual route totals from previous reports by route.

TABLE 3-5
Available Parking at Fitchburg Line Stations

	General spaces	Handicap spaces	Owned by
Fitchburg	67	6	Town
No. Leominster	49	0	Town
Shirley	25	2	Town
Ayer	30	0	Town
Littleton/Rte I-495	15	0	Town
South Acton	287	6	Town
West Concord	146	3	MBTA/ Town
Concord	86	2	Town
Lincoln	161	0	Town
Hastings	6	0	Town
Kendall Green	57	0	Town
Brandeis/ Roberts	70	3	MBTA
Waltham	50	4	Town
Waverley	0	0	n/a
Belmont	0	0	n/a
Porter Square	0	0	n/a
Total	1,049	26	

Source: As represented on MBTA's web site (www.mbta.com/schedmaps/commuter-rail/fitchburg.cfm), December 18, 2001. There is additional, informal parking at a number of the above stations.

MassHighway initiated an environmental review of the site in Spring 2001, engaging consultants to conduct the analysis required for submission to the state's environmental review agency. The preferred local site has major issues related to wetlands, vernal pools and the presence of wildlife habitats; and construction at that location is unlikely to be feasible, compared with expansion of the parking area at the existing station or at another location. Whether at this site or elsewhere, the provision of additional parking capacity on the Fitchburg Line is certainly a worthwhile objective.

An improved station in Littleton—either an expansion of the existing site, or a new station on a nearby site—would provide some relief to parking demand at South Acton and Concord, based on previous observations of parker origins at these locations.[14] It would not eliminate the parking shortage there, because about two-thirds of the existing daily demand at South Acton consists of travelers from Acton itself, Stow and Maynard. None of these are likely to relocate to a Littleton station. Some travelers from Boxborough and possibly Bolton would relocate to a larger Littleton parking facility if available; but others would continue to prefer South Acton, because of the higher numbers of train departures and arrivals at that station.

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[14] In 1993, commuter rail survey results identified 11 and 28 trips originating in Littleton and Boxborough respectively, among the 440 people who boarded at the South Acton station. Another 15 originated in Bolton.

Consequently, the need remains to investigate other options for improving access at Fitchburg Line stations inbound of Littleton/I-495, including additional parking provision and, if feasible, some kind of feeder access. Maynard's efforts to combine shuttle service to South Acton for Maynard residents with Clock Tower Place's existing employee shuttle operation deserve close scrutiny as a potential model for other such services.

Another commuter rail option for some MAGIC residents is the Lowell Line, accessible at the new Anderson Regional Transportation Center in Woburn. This location has 1500 parking spaces available for commuters, and may represent a reasonable park-and-ride alternative for commuters at least from Bedford and Carlisle.

(2) Bus Service

Figures 3-7 and **3-8** illustrate bus service within the MAGIC area. There are several different categories of bus service, with distinctly different markets.

First, there are individual town-supported services. The Town of Lexington runs a minibus service (Lexpress), with the MBTA and the Town contributing subsidy support. Lexpress has a fairly dense route structure based in the Town center (Depot Square), and it runs hourly headways on all its routes from around 7:00 AM to around 6:00 PM (depending on route) daily. Also, Concord has its own town-supported local bus, operated with volunteer drivers. The bus runs a loop connecting several locations in Concord Center, also making one trip per day to one of the nearby supermarkets. The Town of Bedford operates a service which is essentially a demand-responsive van, which is booked like a taxi one day in advance. The van makes one trip per day to the Burlington Mall. Bedford was one of the first communities in which suburban transit services were tried, beginning in the late 1970s, then revived in 1985 after a hiatus. It, together with Lexpress and Burlington's B-line, continues to receive MBTA Suburban Transit funding to this day.

These services are open to anyone who wishes to travel, not just town residents. In fact, however, they tend to serve a market comprised primarily of transportation-disadvantaged town residents: people without cars available (of whom there are very few within MAGIC), elderly residents, people with physical disabilities which prevent them from driving, students needing transportation to after-school activities, and similar categories of people, all of whom represent good markets for transportation services. The services are generally less expensive to operate than traditional large-vehicle bus services, but they do require public subsidy to continue operating.

The second type of service is scheduled commuter service, operated by private carriers, the MBTA, and the Lowell Regional Transit Authority (LRTA). The Yankee Bus Company runs a single trip per day from Acton, via Concord, to downtown Boston and back; and the Gulbankian Bus Company, based in Southborough, runs service from Hudson to Boston via Marlborough and Framingham. These are the only direct private-carrier bus services in this area going to Boston.

However, the MBTA runs half-hourly service from Alewife Station to Lexington Center, Hanscom Field and the Bedford VA Hospital, and recently has added service to the growing Oak Park industrial area in Bedford. In addition, peak-period MBTA bus service to Government Center in Boston serves Burlington and Billerica, towns directly adjacent to MAGIC communities. Indeed, the bus stop within the Sun MicroSystems campus in Burlington is the closest thing to a "regional transit node" in the MAGIC area, offering opportunities for passenger dropoffs and transfers among numerous services. Both LRTA and MBTA bus routes pick up and drop off at this location, and Burlington's mini-bus service (the B-Line) provides local circulation from this point.

(3) Shuttles

Paratransit-type shuttle services offered by the Route 128 Business Council and a handful of individual local companies offer opportunities for commuters in the MAGIC area. The Route 128 Business Council, a Transportation Management Association (TMA) which serves employers in Waltham, Lexington and other locations along Route 128, is the largest operator of such services. The Council manages a comprehensive employer-supported shuttle service, using leased vehicles, which connects member employers with transit stations at Alewife, Riverside, Newton Highlands and several commuter rail stations. Their primary shuttle-bus market consists of city-dwellers from Boston and Cambridge who take the Red Line to Alewife station, and then need a connection to their suburban work sites. Among the MAGIC-area companies which are subscribers to these services are:

Fresenius Medical Care (Lexington)
Hayden Woods (Lexington)
Segue Software
Spaulding & Slye
Stride-Rite

As many as eight runs are made by these shuttles during the AM peak period, from Alewife out Route 2 to I-95 (Route 128). Fares are $2.00 per ride for employees of member companies, $4.00 per ride for others.

Few individual employers offer such services for their own employees, because of the expense involved. Only a few companies/institutions within MAGIC operate their own vehicles, primarily for purposes other than employee commuting,[15] but available to facilitate commuting as a side benefit, e.g., by providing access to remote parking sites, either within or outside their own property. The Lahey Clinic in Burlington is one, the Sheraton Lexington Hotel is another, and Middlesex Community College may do this as

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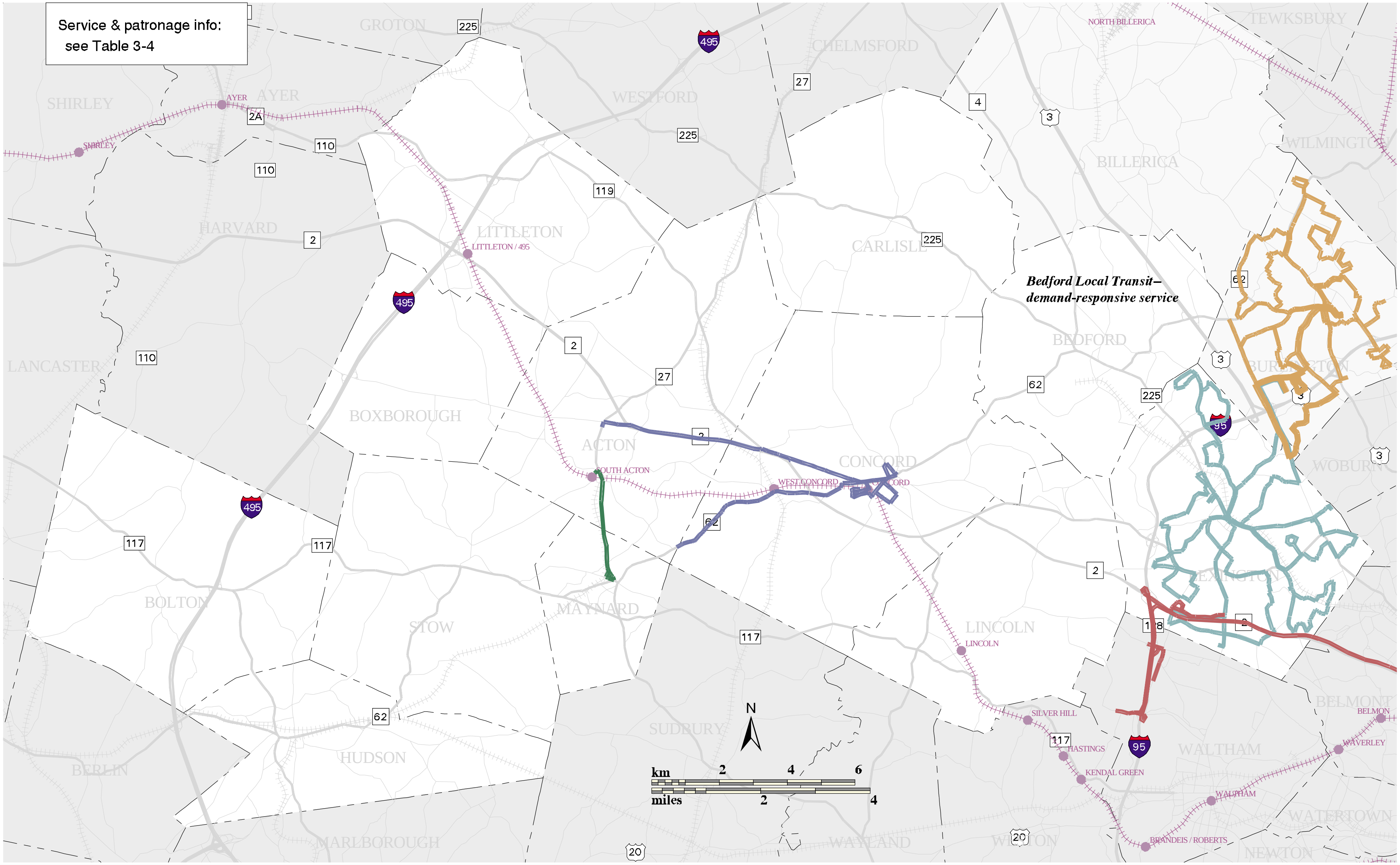
[15] E.g., customer convenience, inter-plant mail services, or emergency deliveries of medical commodities.



Service & patronage info:
see Table 3-4

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Town services

- Lexpress
- Concord Local Bus
- B-Line

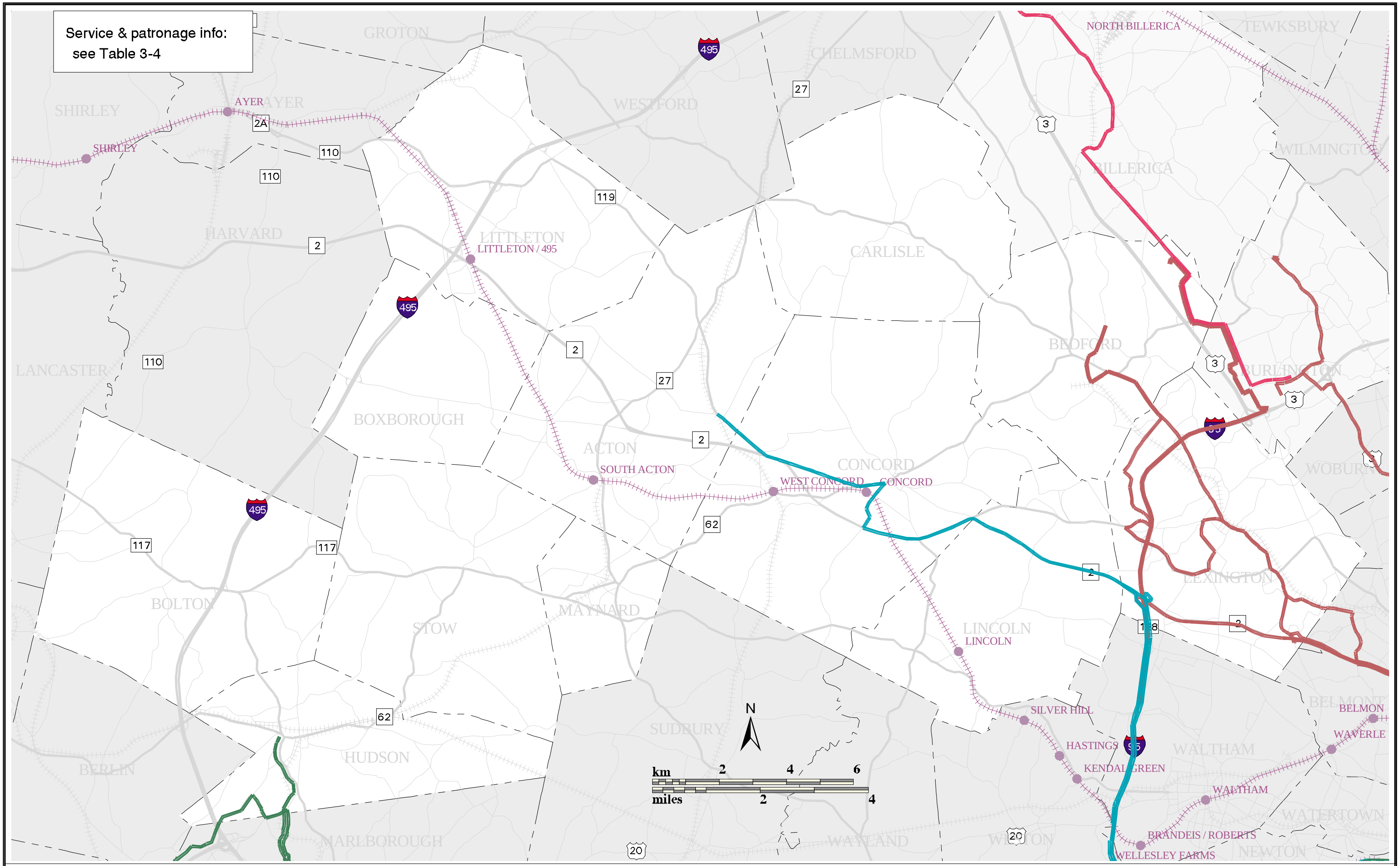
Privately-sponsored shuttles

- 128 Business Council Shuttle
- Clock Tower Place Shuttle

(not shown: shuttles without fixed routes)

Figure 3-7
MAGIC-Area Transit: Town- or Privately-Sponsored Services

February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-21tm.aml



Service & patronage info:
see Table 3-4

CTPS

MAGIC Subregional Area Study

Figure 3-8
MAGIC-Area Transit: MBTA, LRTA, Private Carriers

well. Other employers contract with bus companies to offer limited service as an aide in recruiting workers for odd-hour shifts.

A telephone survey of large employers in MAGIC was performed in order to get information about the types of shuttles and/or transit-ridesharing assistance offered by these companies to their employees. The companies selected to be interviewed were firms of 500 or more employees, since these are likely to be the only firms which could afford to run specialized transportation services for their employees. Most employers were reluctant to provide information about their employee transportation assistance programs—even those businesses which are particularly active in providing support.

Only a select few of the companies contacted own or lease vehicles which are available to employees for transportation purposes (Lahey Clinic [Burlington] and Lincoln Labs [Lexington]). Several others are members of the Route 128 Business Council TMA, and avail themselves of its shuttle services (Stride Rite, Fresenius Health Care). The reticence of almost all the companies contacted, and their reluctance to be identified, make it difficult to determine "reasonable" rates of participation, cost estimates, or much of an overall perspective on these privately-supported services. The most that can be achieved under current law is to develop profiles of the most successful services, and try to determine what makes them successful.

One noteworthy example of employer-sponsored shuttle services is the minibus service provided by Clock Tower Place in Maynard. Clock Tower Place is a complex of renovated mill buildings located in the heart of downtown Maynard and formerly occupied by Digital. There is very little parking close to the mill buildings, which predate the car era, and downtown Maynard is a comparatively compact downtown area with little or no room for parking expansion. The managers of Clock Tower Place own several vehicles (vans and a minibus) which they use to convey employees and visitors to and from Clock Tower's remote parking facilities. In addition, these vehicles are used each morning to convey employees arriving at the South Acton train station down Route 27 to Clock Tower; each evening, the vehicles make the reverse trip, bringing people back up to the train station.

This year, the Town of Maynard was awarded a grant through MassHighway's TDM[16] Enhancement program, to expand this service. Specifically, the intent was to open the service to Maynard residents wishing to make the reverse trip (i.e., up Route 27 to South Acton in the morning, returning on the train and shuttle to Maynard at night).

The characteristics which contribute to Clock Tower's enthusiasm for shuttles, and which seem to describe other companies willing to consider offering shuttle-bus services are the following:

- they tend to be large companies or institutions like colleges or hospitals, typically employing or serving over a thousand people, often providing services to customers who must visit their sites.[17]

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[16] i.e., Transportation Demand Management.

[17] Note that Clock Tower Place is *not* a "single large employer" as described. However, it *is* a fairly unique "showplace"-type conglomerate of leased office space in a cluster of huge, connected buildings located in the middle of a relatively dense downtown area with poor vehicular access. It has an active and involved

- they tend to employ and/or serve large numbers of people who fall into markets traditionally thought of as more transit-dependent than average: e.g., students, the elderly or infirm, relatively low-salaried or part-time personnel, or secondary wage-earners from households where the primary wage-earner has the family car.
- they have multiple potential uses for vehicle fleets, e.g., delivery services, field trips, or other purposes.
- management itself (not just employees or visitors) would directly experience a penalty for *failing* to provide such services; possible penalties include demand for additional, expensive parking construction; difficulty recruiting or keeping desired employees, customers, or other desired visitors; perceived reduction in real estate value or marketability because of lack of accessibility. In the case of Clock Tower Place, provision of such service is a survival mechanism, because the lack of parking detracts from the marketability of the space without an alternative means of access.

The combination of these factors results in a level of employer commitment which is essential to the success of such programs. Merely using "seed money" to operate a bus route, without securing such involvement by employers, invariably results in very low ridership, lack of public support for the subsidies inevitably required to keep the services running, and cancellation after a brief period of time.

Firms or institutions where these criteria do *not* apply generally take the position that getting to work is the employee's problem, and that it is not their own responsibility to facilitate employee transportation beyond the provision of adequate free parking. Few are receptive to the idea of playing an active role in influencing how their employees get to work, although most are willing join a TMA as long as the cost is not too high and membership is a precondition of permitting for construction.

(4) Transportation Management Associations (TMAs)

The aforementioned Route 128 Business Council is the only TMA currently active within the MAGIC area. However, several other TMAs exist on the immediate periphery of the MAGIC area, including the Greater Lowell/Route 3 TMA and the MetroWest TMA. These TMAs all offer ride-sharing matching, transit information, and a "Guaranteed Ride Home" program for participating members. The Route 128 Business Council's shuttle services have already been described. The MetroWest TMA offers a shuttle service connecting the Natick and West Natick commuter rail stations with subscriber employers in the Speen Street area of Natick.

In addition, CARAVAN for Commuters is currently working with Hanscom Air Force Base and nearby employers to develop a Hanscom TMA. The Base has its own Transportation

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management which needs to compensate for severe parking deficiencies in order to attract and retain tenants. The Clock Tower management does this admirably well, and is to be congratulated on its efforts to provide in-house services to reduce the need for employee travel off-site, as well as its willingness to extend its shuttle services to bring local residents to the train station in South Acton. However, it is far from typical. It cannot be compared usefully with the types of campus-like auto-oriented office developments now being contemplated in Boxborough, Littleton, and elsewhere along I-495.

Coordinator, who will be instrumental in the formation and maintenance of a new TMA here.

TMAs, like employer-sponsored shuttle services and carpool programs, work best when their sponsors are committed employers. The rationale for employer commitment may be: (a) state or local requirements which predicate permit approvals on active TMA involvement; and (b) a direct financial benefit to the employer as a result of his involvement. Without these motivating factors, TMAs tend to be perfunctory organizations with membership rosters which dwindle over time.

(5) Park-and-ride lots

The only formal park-and-ride lots currently available within the MAGIC towns are those at the commuter rail stations, which are filled to capacity early in the day. Several lots exist on the periphery of MAGIC communities—notably the new Woburn Industriplex site, the I-495 lot at Route 62 in Berlin, and the MassHighway District 4 Park-and-Ride lot adjacent to Route 2 in Arlington. Park-and-ride lots will also be created along Route 3 as part of the reconstruction project: one is under construction in Tyngsborough, which is too far north to benefit MAGIC residents, but it will intercept through traffic on Route 3 from New Hampshire. A second park-and-ride lot was proposed at the junction of Route 3 and Route 62 in Bedford, but that site is no longer available, primarily because of local opposition.

Additional sites in the MAGIC area may be worth investigating. The best sites for such lots are close to major roadways, with easy on-off access in both directions. It would be preferable if such sites were also served by transit (bus or other); but lots which serve only carpools and vanpools may also attract limited use, particularly by travelers with longer work trips or making midday trips. A recent CTPS study[18] recommended five potential sites for new lots along I-495, including one in the MAGIC area, at Route 117 in Bolton. Additional studies of lots in underserved markets can be undertaken using the evaluation tool developed by CTPS for determining the potential for success of a prospective site.

(6) Bicycle/pedestrian facilities

The MAGIC subregion is one of the most active in the metropolitan area with respect to bicycle facilities:

- The Minuteman Bikeway through Arlington, Lexington and Bedford is reported to be the busiest of the 1000+ rail-trail corridors in the country. Currently it is almost 10 miles long, extending from Alewife Station at the edge of Cambridge to Loomis Street and the new Bedford Depot Park. From that point, it connects with another pathway: the right-of-way of the old narrow-gauge railroad between Bedford and Billerica. Further extension of Minuteman itself may be difficult because it would require crossing Hanscom Air Force Base, the Assabet River, and Route 2.

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[18] Wilson, Alicia Powell, "Estimating Demand for MassHighway Park-and-Ride Lots," CTPS Technical Memorandum, July 28, 1999.

- The Bruce Freeman Trail between Lowell and Sudbury is a 21-mile multiuse trail which is being constructed in sections on the old Lowell Secondary right-of-way. The longer of two sections, a 15-mile segment which would connect Westford and Sudbury via Acton and Concord, would require bridges over or detours around both the Assabet River and Route 2; but some segments may be buildable in advance of these more difficult connections.
- The first ¾ -mile section of the Assabet River Rail Trail in Marlborough officially opened in May 2001. Portions through other communities are still being designed. When completed, the trail will be 12 miles in length, connecting the five communities of Marlborough, Hudson, Stow, Maynard and Acton.

Other opportunities for bicycle/recreational trails are still in design or at the conceptual stage. These include:

- the portion of the Central Mass. right-of-way through Hudson, approved by Hudson (and all other towns except for Weston) as the proposed Wayside Rail Trail.
- the potential for connections between the Bruce Freeman Trail and the Minuteman Trail, through Carlisle.

Pedestrian initiatives tend to be much more localized, and include provision of crosswalks and/or sidewalks when roadways are reconstructed or when recommended by a traffic study. The denser town centers of Lexington, Bedford, Maynard, Acton, and Hudson typically have marked crosswalks and signs giving pedestrians the right-of-way, and, in some locations along arterial roadways, traffic signals with pedestrian actuation. In other locations, the appropriateness of pedestrian designation depends on the characteristics of the roadway and the surrounding area. Typically requests for consideration of improved pedestrian facilities are addressed by conducting a traffic study with observations of pedestrian activity, after which a recommendation is made, usually to be acted upon by local public works or planning officials.

* * * * *

There is considerable interest among the MAGIC communities in having additional transit and transit support services of these kinds made available. Their priorities include: more frequent commuter rail service on the Fitchburg Line (together with the desired Littleton train station); investment in reverse-commute trains; additional scheduled public bus services; and more employee shuttles, especially for individuals with work locations within MAGIC towns.

4. CURRENT INITIATIVES AT CONGESTED AREAS

The January 2001 Congestion Management System report inventoried congestion problem locations in MAGIC, as identified through field monitoring activities and comments from the public review process. Monitoring efforts identified long segments of Routes 2, 3, 4/225 in Bedford, Route 62, and I-95 as being congested, as well as shorter segments of Route 27 in Maynard, Route 85 in Hudson, Route 117 in Stow, Route 4/225 in Lexington, and the Lexington Minuteman Triangle area. Comments from responders resulted in the addition of long segments of Routes 2 and 2A in Lincoln, Concord and Acton, most of Route 27 through Acton, the Middlesex Turnpike, and numerous intersections to the list of identified congestion problem areas. The problem locations identified are shown in **Figure 4-1**.

This section addresses each location identified as congested and summarizes any recent activities or proposals for improvement. It also identifies locations which may be considered for future study.

(1) Route 2 through Lincoln, Concord, and Acton

This section of the Route 2 corridor has experienced chronic congestion for years, principally because it remains a signalized arterial roadway, 2 lanes in each direction with turning lanes at key intersections. The remainder of Route 2 in both directions is a limited-access expressway facility. Several projects are currently underway to alleviate congestion in the Route 2 corridor, including:

- grade-separation of the intersection of Route 2 with Cambridge Turnpike and Route 2A (Crosby's Corner) in Lincoln;
- design studies to replace the existing rotary adjacent to the MCI facility in West Concord;
- developer-sponsored coordination of traffic signals at 3 locations along Route 2 near the rotary;
- additional safety improvements along the Route 2 corridor in Concord and Acton.

As mentioned earlier, analyses were already undertaken in past Route 2 corridor studies to evaluate the effects of grade-separation options at other signalized intersections. Such activities are probably the limit of what can be done to reduce congestion in the Route 2 corridor itself, because of agreements which stipulate that Route 2 cannot be widened beyond 2 lanes each way in this area. It may be possible to identify park-and-ride locations in the vicinity of the reconstructed rotary which would provide opportunities for carpool/vanpool formation and/or bus transit in this corridor.

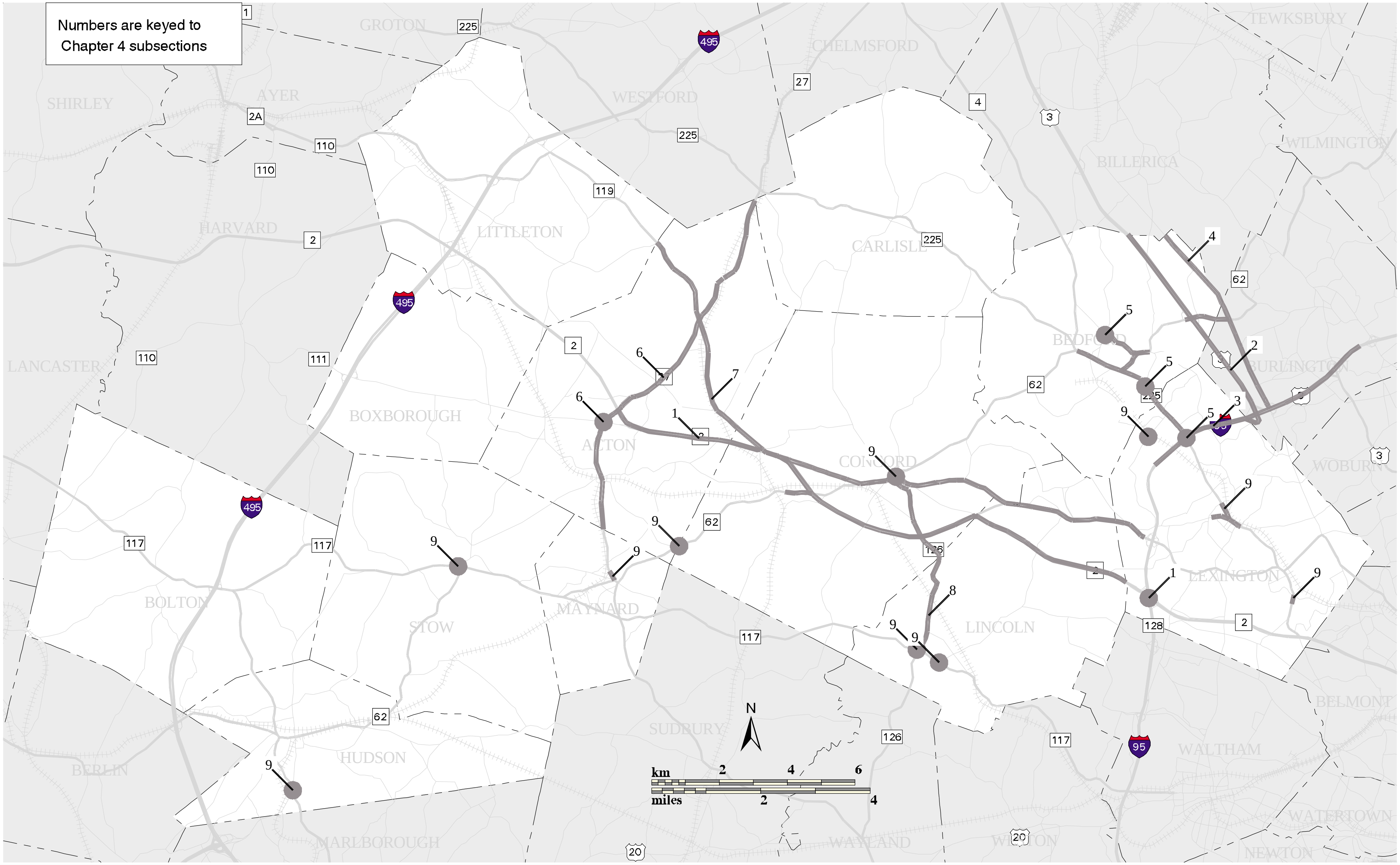
Numbers are keyed to Chapter 4 subsections

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Figure 4-1
Mobility Problems Identified in CMS Report

February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-23cmp.aml

(2) Route 3 from Billerica through to I-95 (Route 128)

Like Route 2, Route 3 has been a long-term congestion problem, which is being addressed by the reconstruction project, just beginning. This project will add a lane in each direction to Route 3, restoring a functioning breakdown lane in each direction. Improvements will be made to intersections on the local roads served by interchanges. By improving flow on Route 3, the improvements should result in attracting some traffic which currently uses local MAGIC roadways to bypass Route 3 congestion.

(3) I-95, Lexington through the area of Route 3/3A exits

At present, no projects or proposals are active in this section of I-95 (Route 128) within Lexington, other than resurfacing. Alternatives which might be examined in an attempt to address congestion in this section could include:

- ramp metering at one or more interchange entrances
- investigation of park-and-ride lots in the area of the existing interchanges
- adding to existing Route 128 shuttle services operated by the Route 128 Transportation Task Force
- interchange improvements at the Route 4/225 and Route 3 interchanges

(4) Middlesex Turnpike/Route 62, Bedford

This area has within recent years been the focus of large-scale development initiatives, promoted by the 3 towns of Bedford, Burlington and Billerica.[19] In conjunction with developments, a major road-building was undertaken to provide access to and from both I-95 and Route 3 in this area. These efforts are continuing with the approval of the towns, as development also continues unabated.

(5) Route 4/225, Bedford and Lexington

The jughandle intersection with Hartwell Avenue, Lexington, continues to be a chronic congestion location along Route 4/225. In addition, the area near the intersection of Route 4/225 and Route 62 experiences long backups and delays as Route 62 becomes a more important conduit to the expanding Middlesex Turnpike industrial area. This location would probably operate more efficiently and more safely if the intersection were signalized. However, long delays will probably remain the norm here, if additional capacity is not provided. It may be that pressures on this intersection will be reduced as a result of Route 3 improvements, which should make it less desirable for Route 3 traffic to seek alternate routes through Bedford. In addition, the intersection of Route 4/225 at Shawsheen Road was identified as a congestion problem.

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[19] *Tri-Town Study*, cited above.

(6) Route 27, Acton

This corridor was identified as a problem area by the town of Acton, which is currently involved in a consultant study of the corridor. Approximately 6 years ago, the town undertook a study focusing specifically on the Kelly's Corner area of Route 27 just south of the Route 2 interchange. CTPS continues to work with Acton and its consultants, exchanging data and incorporating the findings of focused area studies into the overall study of traffic movements in this area. Within the past few years, MassHighway reconstructed the intersection of Route 2A and Route 27. This intersection now functions well, as reported by the Acton planner.

(7) Route 2A, Acton, Concord and Lexington

The entire corridor was identified as having congestion problems. In addition, the section of Route 2A/119 through Littleton is also reported to experience congestion problems. In Acton, Route 2A operates as one wide lane in each direction. Signalized intersections are infrequent, but large sections of the Route 2A corridor have been developed as commercial strip areas. Consequently, there are high concentrations of commercial driveways along the roadway, and traffic flow is disrupted by vehicles making left turns into these driveways. The town planner expressed interest in a corridor study of Route 2A aimed at solving the left-turn problem by adding left-turn lanes at selected locations, or creating a 3-lane cross-section including a center left-turning lane. Such a study should also include Route 2A/119 through Littleton.

In Concord, Route 2A shares the right-of-way with Route 2 for part of its length, and also shares in the problems of that roadway. The rotary adjacent to the Concord MCI facility creates delays for Route 2A traffic, because Route 2 traffic inside the rotary leaves few gaps for eastbound Route 2A traffic. This problem will be addressed as part of the overall design solution for the rotary and Route 2 in this area.

Route 2A in Lincoln is a narrow 2-lane roadway with no traffic signals east of Crosby's Corner. This road occupies the same right-of-way as the Battle Road through the Minuteman National Park. The National Park Service has as a long-term objective the downgrading of Route 2A in order to restore the original character of the colonial roadway in this area, an objective which, for the time being at least, would run counter to attempts to relieve congestion here. Route 2A in this section also serves as the principal access to Hanscom Field, to businesses located on or adjacent to the roadway, and to the Minuteman Vocational and Technical School. A limited reconstruction of Route 2A in the vicinity of Massachusetts Avenue and Forbes Road, and projects are currently included on the TIP list to improve bicycle connections in and around Hanscom Drive, the principal entrance to Hanscom Field from Route 2A. However, no other proposals or projects are currently under consideration for congestion reduction in this area.

(8) Route 126, Lincoln and Concord

This corridor was added to the list of congestion problems in response to reviewers' comments, although only the short section which represents the approach to the Route 2 intersection was highlighted as a congestion problem in the 1996-97 speed run cycle. To our knowledge, there are no studies, proposals or projects for this section of Route 126, with one exception. This roadway passes by Walden Pond; and efforts are underway by a town-based committee to pursue relocation of Route 126 so that visitors to the Pond would no longer have to cross the road to reach the parking lot. The status of these efforts is unclear at present. If the roadway were relocated at some point, this might be combined with intersection improvements at Route 2 to relieve present queuing.

(9) Intersection/driveway-related congestion at various points

A number of the locations identified in the Congestion Management System Plan for this area are isolated intersections or short sections of roadway where improvements which are local in nature might be considered, if they are not already under consideration. These include the following:

- Route 4/225 in Lexington – the section identified as congested is the approach to the unsignalized intersection of Route 4/225 and Massachusetts Avenue. This location has already been identified as a candidate where a traffic signal warrant analysis would be of use to the Town of Lexington.
- the section of Route 4/225 between the Minuteman statue and Waltham Street in Lexington – the Massachusetts Avenue/Waltham Street intersection itself is included in the Congested Signalized Intersections study being performed by CTPS. The rest of the Battle Green area was the focus of a speed study performed by BSC Consultants for the Town of Lexington in 1999. This is a busy commercial area, with on-street parking on both sides, access to and from off-street parking in mid-block, 4 lanes of traffic, mini-bus circulation and layover requirements, numerous and frequent pedestrian crosswalks, and large numbers of tourist visitors. It is unlikely that measures to improve traffic speeds through this area would be either desirable or welcome from a safety standpoint.
- I-290 connection at Route 85, Hudson – this location is the focus of an ongoing study by MassHighway, which is nearing completion.
- Route 117 in Stow, between Crescent Street and Gleasondale Road – congestion at this location may be associated with the unsignalized intersection at the intersection of Great Road (Route 117) and Gleasondale Road (Route 62). Volumes on Route 117 are high enough to create long waiting times for traffic turning left from either street. It is not clear whether this situation is believed to be unsatisfactory enough for signalization to be considered at this location.
- Route 27 exiting downtown Maynard – while the entire length of Route 27 moves slowly during peak periods, the downtown area is particularly slow. In part, this condition may be associated with the intersection of Route 27 at Concord Avenue, identified by Maynard officials as a possible high accident location. No studies of this location are currently underway, to our knowledge, but the location is a candidate for CTPS study mentioned by the Maynard planner.
- Route 62 at High Street, Acton – this location, mentioned by a commenter on the draft CMS plan, is immediately adjacent to the Route 62 bridge over the Assabet River. The road turns sharply at this location, and sight distance may be limited around the mill and factory buildings located here. It is known that minor improve-

ments were made to a nearby section of Route 62, by a Concord developer. The Concord planner identified this location, and the entire Route 62 corridor up through West Concord to the intersection with Route 2, as a possible worthy location for a future corridor study.

* * * * *

In addition to these ongoing and prospective activities at locations identified as problem areas in the 2001 Congestion Management System report for MAGIC, other studies and initiatives are currently in planning or design. Projects currently listed in the regional Transportation Improvement Program (TIP) Annual Element are summarized in **Table 4-1** and **Figure 4-2**. Other pending actions resulting from developer- or town-initiated study are shown in **Figure 4-3**. CTPS is also engaged in several studies in the MAGIC region; these are shown in **Figure 4-4**.

TABLE 4-1
Current TIP Projects by Status,
September 2001

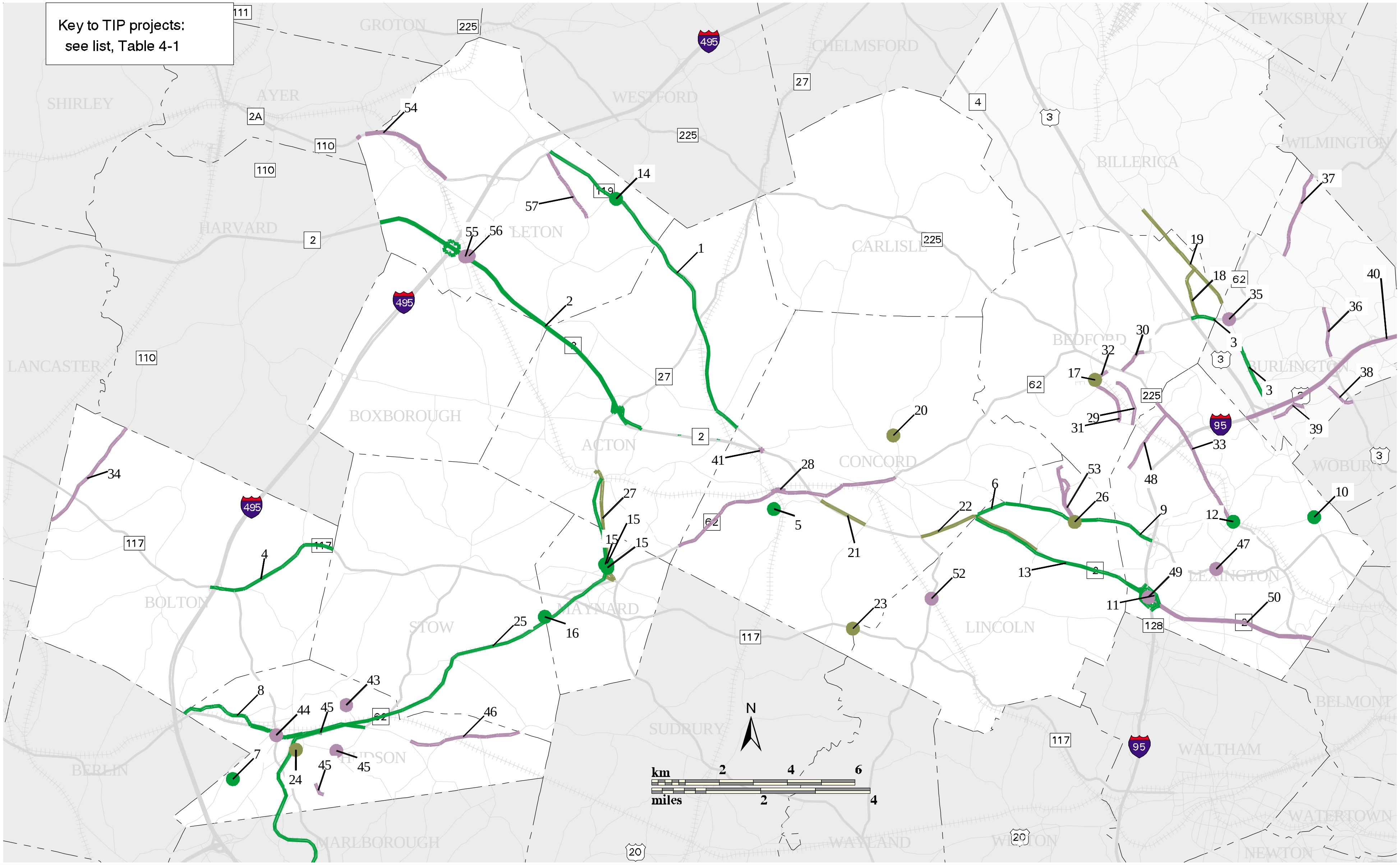
KEY NUMBER (see **Fig. 4-2**)	TOWN	PROJECT	TIP-ID NO.
A. Projects Already Constructed or Advertised			
1	Acton /Littleton	Great Road resurfacing	601363
2	Acton/Boxborough/Littleto	Route 2 improvements	601222
3	Bedford/Billerica/Burlingto	Route 62/Middlesex Turnpike widening	602079
4	Bolton	Route 117 reconstruction	600580
5	Concord	Pine St Bridge replacement	600638
6	Concord/Lexington/Lincoln	Stone wall on Route 2A	601844
7	Hudson	Chapin Road Bridge	160040
8	Hudson	Central St Hudson	600575
9	Lexington	Marrett Rd Lexington	043550
10	Lexington	Lowell St-Woburn St	600883
11	Lexington	Rt 2/I-95 (Route128) Interchange	601391
12	Lexington	Depot Square improvements	602353
13	Lexington/Lincoln	Route 2 median barriers	602308
14	Littleton	Rt 119/Powers Rd Signal	600540
15	Maynard	3 intersections near town center	601577
16	Maynard/Stow	White Pond Rd Bridge	601946
B. Programmed in Current TIP			
17	Bedford	Depot Park improvements	602346
18	Bedford/Billerica/Burlingto	Crosby Drive widening/Rt 3 ramp	029490
19	Bedford/Billerica/Burlingto	Crosby Drive/Middlesex Turnpike	029491
20	Concord	Monument St Bridge	601442
21	Concord	Route 2 reconstruction	602626
22	Concord/Lincoln	Crosbys Corner	602984
23	Concord/Lincoln	Rt 117 Bridge	603079
24	Hudson	Broad St Bridge	601907
25	Hudson/Marlborough	Assabet Rail Trail	602947
26	Lincoln	Battle Road Trail Underpass	---
27	Maynard & Acton	Maynard Shuttle	---
C. Enhancement Projects			
28	Concord	Main St Landscaping	---

Table 4-1 (cont'd)

D. Supplemental List (TIP Appendix C)

29	Bedford	Wiggins Ave	---
30	Bedford	Brooksbie Rd/Rt 62	---
31	Bedford	South Rd	---
32	Bedford	Loomis St	---
33	Bedford/Lexington	Rt 4/225 resurface	602149
34	Bolton	Rt 110 (Still River Rd)	602252
35	Burlington	Reconstruct Middlesex Turnpike/Route 62 Interchange	600840
36	Burlington	Cambridge St Reconstruction	601316
37	Burlington	Wilmington Rd	---
38	Burlington	South Bedford St	---
39	Burlington	Wheeler Rd	---
40	Burlington/Reading/Wobu	I-95 safety	600821
41	Concord	Concord Rotary Safety	602091
42	Concord	Rt 62 (Main St) reconstruction	602127
43	Hudson	Cox St Bridge	601906
44	Hudson	Main St Bridge	602131
45	Hudson	Reed Rd/Forest Ave/Marlborough St intersection improvements	---
46	Hudson	Main St Reconstruction	601381
47	Lexington	Marrett Rd/Waltham St signal	602133
48	Lexington	Hartwell Ave Phase 2	031050
49	Lexington	Route 2 Bridge	600703
50	Lexington	Route 2 Resurfacing	602896
51	Lexington/Waltham	Hobbes Brook Reservoir*	601868
52	Lincoln	Rt 126 Bridge	086461
53	Lincoln	Hanscom Dr bicycle facility	602779
54	Littleton	Rt 2A resurfacing	602751
55	Littleton	Rt 2 Interchange to proposed MBTA station	---
56	Littleton	Commuter rail station	---
57	Littleton	Goldsmith Road reconstruction	---

*not shown on map



Key to TIP projects:
see list, Table 4-1

● ▬ Advertised or completed

● ▬ Programmed in TIP

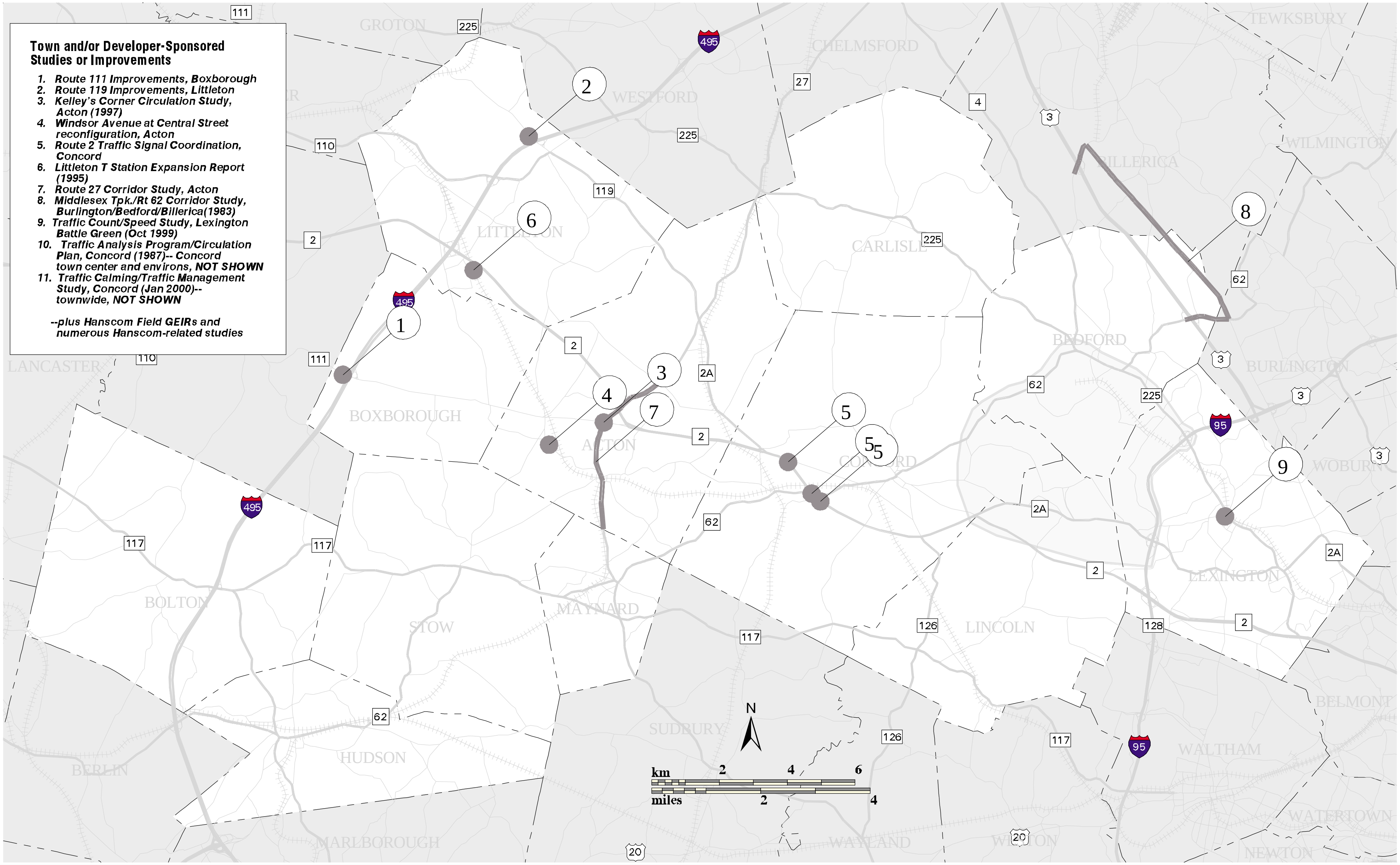
● ▬ Appendix C or Enhancement Project

CTPS

MAGIC
Subregional
Area Study

Figure 4-2
Projects in 2002-2007
Approved TIP, by Status

February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-15tip.aml



Town and/or Developer-Sponsored Studies or Improvements

1. Route 111 Improvements, Boxborough
2. Route 119 Improvements, Littleton
3. Kelley's Corner Circulation Study, Acton (1997)
4. Windsor Avenue at Central Street reconfiguration, Acton
5. Route 2 Traffic Signal Coordination, Concord
6. Littleton T Station Expansion Report (1995)
7. Route 27 Corridor Study, Acton
8. Middlesex Tpk./Rt 62 Corridor Study, Burlington/Bedford/Billerica(1983)
9. Traffic Count/Speed Study, Lexington Battle Green (Oct 1999)
10. Traffic Analysis Program/Circulation Plan, Concord (1987)-- Concord town center and environs, NOT SHOWN
11. Traffic Calming/Traffic Management Study, Concord (Jan 2000)-- townwide, NOT SHOWN

--plus Hanscom Field GEIRs and numerous Hanscom-related studies

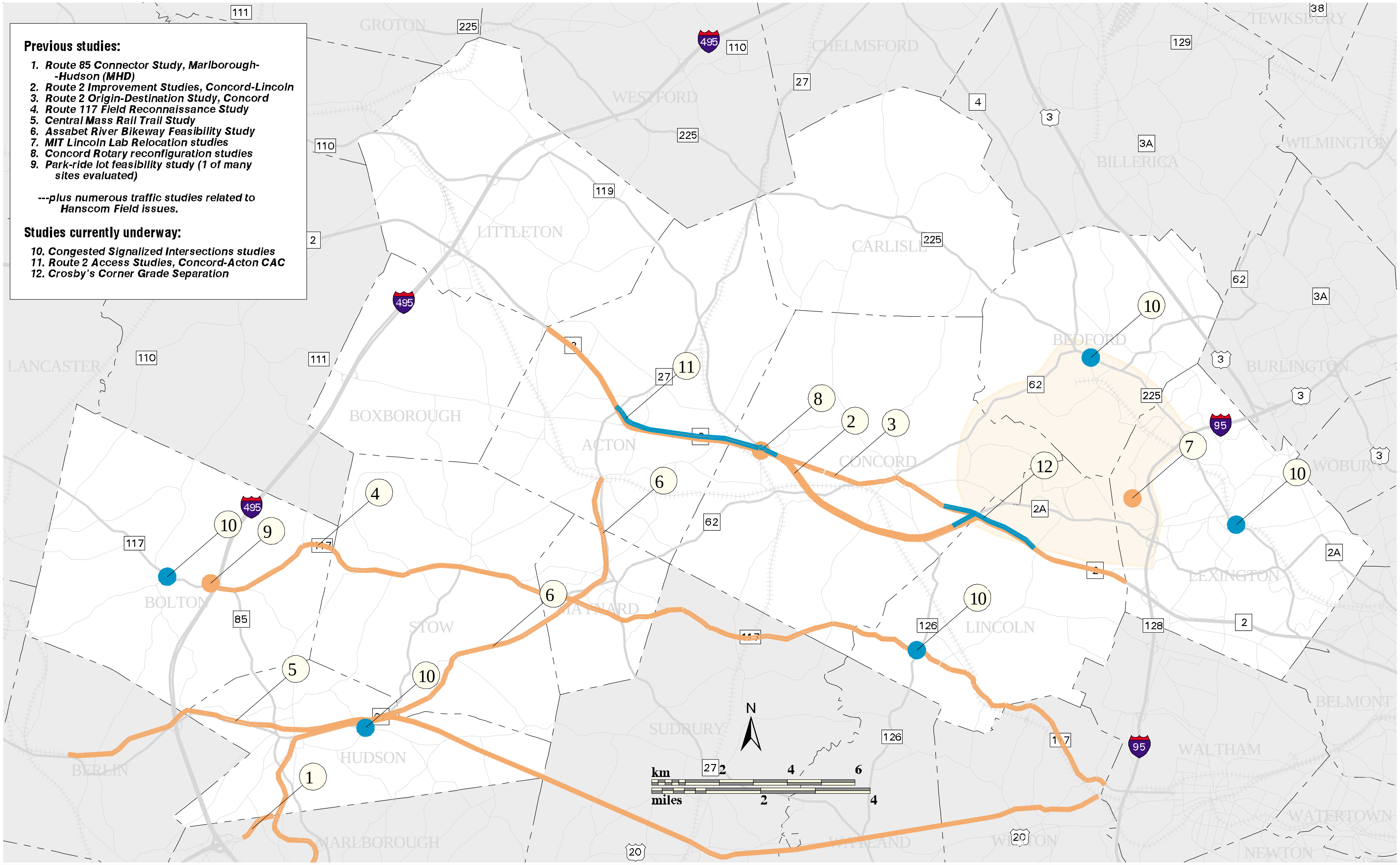
● ▬ Study or Project

▭ General study area for Hanscom-related issues

CTPS
MAGIC
Subregional
Area Study

Figure 4-3
Town- and/or Developer-Sponsored Studies & Projects

February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-14loc.aml



Previous studies:

1. Route 85 Connector Study, Marlborough--Hudson (MHD)
2. Route 2 Improvement Studies, Concord-Lincoln
3. Route 2 Origin-Destination Study, Concord
4. Route 117 Field Reconnaissance Study
5. Central Mass Rail Trail Study
6. Assabet River Bikeway Feasibility Study
7. MIT Lincoln Lab Relocation studies
8. Concord Rotary reconfiguration studies
9. Park-ride lot feasibility study (1 of many sites evaluated)

---plus numerous traffic studies related to Hanscom Field issues.

Studies currently underway:

10. Congested Signalized Intersections studies
11. Route 2 Access Studies, Concord-Acton CAC
12. Crosby's Corner Grade Separation

CTPS

MAGIC
Subregional
Area Study

● — Previous studys

● — Study currently underway

▨ General study area for Hanscom-related studies

Figure 4-4
CTPS Studies in MAGIC
Subregion--Current & Previous

February 05, 2002 62101 pl_mg-13ctp.aml

5. NEXT STEPS: PROPOSED ADDITIONAL STUDIES

In addition to the locations identified in sources described in Chapter 4, the MAGIC Committee and the town planners and administrators from each MAGIC town were asked for their own views regarding studies or projects worthy of planning investment within their towns. The results of these discussions are summarized in **Table 5-1**, with priority rankings provided by MAGIC members.[20] This table is an initial list of planning activities aimed at evaluating specific locations or specific problems not otherwise being addressed. It is anticipated that this will not be a one-time list, but will be updated periodically as part of continued Congestion Management System efforts. There is considerable overlap between the problem areas cited by town officials and the congested locations observed during CMS monitoring activities and catalogued in the CMS report.

Under Phase II of the study, a subset of the issues, locations and opportunities identified in **Table 5-1** will be investigated, and possible solutions or approaches outlined. It should be noted that the list includes *all* activities and issues identified by respondents in MAGIC, including some which do not lend themselves to the technical analysis methods and tools available to CTPS. This is noted in the Table where relevant. Criteria for determining which issues or problem locations are appropriate targets of CTPS analysis efforts are as follows:

- The issue or problem is related to existing congestion or the potential for improved mobility;
- Conceptual solution strategies are likely to be consistent with local goals and objectives;
- The issue or problem can be addressed effectively by applying analytical and planning tools available to CTPS;
- A study of the issue or problem can be fit into the CTPS budget and timetable.
-

Based on these criteria, the following items, shaded in **Table 5-1**, are recommended by CTPS as items which could usefully be included in the Phase II shortlist:

a. Monitoring of existing shuttle services to determine how well they are used, and "what works"
b. Potential for feeder services to South Acton and Concord commuter rail stations from Stow, Boxborough, and other nearby towns
c. Concord-Sudbury bikeway feasibility study
d. Park-and-ride lot reconnaissance study
e. Minuteman Bikeway/Bruce Freeman Trail connection through Carlisle: feasibility study

These are regarded as the most promising items in **Table 5-1**, in terms of studies likely to yield projects which can be advanced to the satisfaction of MAGIC and the member towns. Probably only three or four of these can be advanced during Phase II, within the next fiscal year. Other items, from the shortlist or from **Table 5-1**, can be added on as work items in subsequent funding cycles. Still others are items more appropriately advanced through other agencies (MBTA, CARAVAN for Commuters), state- or locally-sponsored consultant studies, or private initiatives.

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[20] MAGIC's original, revised version of this table is also included, in Appendix B.

TABLE 5-1
MAGIC Subregional Area Study:
List of Potential Projects/Studies for Phase II*

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	MAGIC Committee Rating	Relation to Congestion Mgmt.	CTPS Applicability
A. SHUTTLE SERVICES						
1. Improvements to Clock Tower shuttles	MAGIC Committee	Possibilities for expansion of existing shuttles serving South Acton train station		2A	High	Town proposals already under review. CTPS may have opportunity to evaluate once in operation.
2. Monitoring of underutilized/ inefficient services	MAGIC Chairman	Existing services need to be monitored—at present, there's little information about what's operating and how well it works	Expand ride-check program, create reporting mechanism, develop measures of effectiveness for evaluating shuttle-type services	2	High	
3. Regional park-and-ride lots	MAGIC Committee	Provide park & ride spaces in existing parking lots, serviced by shuttle	See **D.5** below	1	High	
B. COMMUTER RAIL-RELATED IMPROVEMENTS						
1. Parking expansion alternatives for South Acton Station	Acton Planner (Stow Planner—see below)	Town concerned about severe parking shortage at South Acton station but ambivalent about expanding parking supply because of increased out-of-town traffic	Identification of strategies to reduce demand for parking while maintaining attractiveness of rail use	1B	High	
2. New Littleton CR station at Route 2/I-495	Littleton/ Acton/ Concord planners	General interest among all communities in large new CR station to relieve overcrowding at downstream parking lots	Feasibility study for alternative station sites? (MassHighway project—new ENF about to be issued—at best, we'd support consultants)	1A	High	No role for CTPS at present.
3. Lincoln town center	Lincoln ExecSecy/ Plng Bd Secy	Town trying to relocate post office, reconfigure downtown; conflicting demands for parking between train station and mall	Parking demand study related to joint use of lot by commuter rail patrons & shoppers	1C	High	

*MAGIC Committee annotated version reproduced in **APPENDIX B**.

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	MAGIC Committee Rating	Relation to Congestion Mgmt.	CTPS Applicability
4. Commuter rail schedule modifications	Clock Tower Place representative	Current train schedules have few options for commuters in reverse-peak direction. Would like to explore more reverse-commute service.	Feasibility and/or demand study (*Added by MAGIC Committee*: "Work cooperatively with Devens, I-495 Initiative and legislators on reverse-commute problem")	3	Moderate	Feasibility/ demand issues already addressed as part of CTPS reverse-commute study
5. Regional park-and-ride lots	MAGIC Committee	Provide park & ride spaces in existing parking lots, serviced by shuttle	See **D.5** below	1		

C. LOCAL BUS/PARATRANSIT SERVICES

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	MAGIC Committee Rating	Relation to Congestion Mgmt.	CTPS Applicability
1. Potential for bus service connecting Stow with South Acton CR station	Stow Planner	Inadequate parking at South Acton CR station to serve demand from Stow commuters. Feeder bus service would potentially address.	Assess demand, likely success of bus service to South Acton train station	3A	Moderate/High	
2. Bedford Local Bus	MAGIC Committee	Possibilities for expansion of existing (mainly elderly/disabled) service and tie in with other nearby local services	Service examined as part of present study	3B		
3. Concord Local Bus	Concord Bus Committee/ CTPS	Existing town-owned large-size bus may be underutilized	Identify other potential uses for existing bus (such as shuttle to train)	3C	Low	
4. Transit-district zoning/financing modifications	Bedford Planner/ MAGIC Chairman	Several towns implementing commercial zoning changes to tie variances to imposition of "transit fees"	Documentation of current experience, assessment of applicability to MAGIC communities (esp. Boxborough)	(no rating)	Moderate	May be more appropriate for other agencies.
5. Hanscom-based TMA	Hanscom AFB Planner	AFB interested in facilitating TMA efforts, exploring additional strategies	Assist AFB, Field, in designing or evaluating TMA-type strategies	1	High	Not typically a CTPS activity—CARAVAN is best option.

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	MAGIC Committee Rating	Relation to Congestion Mgmt.	CTPS Applicability
6. “Super TMA” in area around Bedford, dealing with employee transportation	MAGIC Representative, Bedford	Interest in creating a quasi-Transportation Authority or super TMA to serve the interests of employers and general public (employees could ride "free" by showing company ID's; public would pay fares). Functions of services would be to interface with the MBTA transit resources and to provide intra- and inter-town mobility.	Creation of TMA or local authority to fulfill these functions.	2	Moderate	Role for CTPS, if any, needs to be defined. Employers and/or towns need to apply for funding through TMA program
7. Lexington Tourism Shuttle	Lexington Economic Development Coordinator	Interest in expanding Lexpress to add dedicated line to serve Lexington historical sites (taverns, Museum of Our National Heritage, Minuteman National Historic Park), and connect visitors (both in cars and in tour buses) with the best attractions, parking, and services	Evaluation of existing services; examination of potential to add or divert Lexpress routes	2B	Low	CTPS has expertise in this area, if NPS/Town of Lexington/ Lexpress operators are amenable
8. Reverse commute – experience and other (non-rail) opportunities	MAGIC Chairman	Documentation of reverse-commute activities (successful and unsuccessful); identification of other alternatives to facilitate reverse-commuting within MAGIC, including adding more rolling stock	Additional reverse-commute studies—survey existing riders, determine characteristics of transit reverse-commuters	2	Moderate	
D. RIDE-SHARING/BICYCLE/PEDESTRIAN IMPROVEMENT PROJECTS						
1. Bicycle paths along Routes 117 and 62, Stow	Stow Planner	Town hoping to promote greater bicycle use, but heavy traffic inhibits potential cyclists	Design studies; identification of right-of-way/shoulder widths; general feasibility study	2	Low	Feasibility study possible—design work not CTPS focus
2. East Acton Village Center	Acton Planner	Town would like to create small, commercial “village center”-type area in East Acton	Traffic/circulation/ pedestrian studies in support of alternative concepts	3	Low/ Moderate	

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	MAGIC Committee Rating	Relation to Congestion Mgmt.	CTPS Applicability
3. Development of a Baker Avenue TMA, with associated ride-sharing/ transit encouragement	Concord Planner	Development is proceeding at the Baker Avenue industrial area, and Concord is encouraging TMA-type activity there. But difficult to achieve for multi-tenant sites.	Support to TMA organizational efforts, with analysis of, e.g., shuttles to Concord train station, other strategies	3	Moderate	CTPS doesn't organize TMAs, but can work in support of organizers such as CARAVAN
4. Concord/Sudbury bikeway	Concord planner	There is interest in seeing abandoned rail right-of-way considered for bikeway	Feasibility study	2	Moderate	
5. Reconnaissance to find park-and-ride lots within MAGIC	Carlisle MAGIC representative/ CTPS	There are relatively few park-and-ride lots for carpools/vanpools within the MAGIC area.	Investigation of potential to create additional park-and-ride lots within MAGIC, at supermarkets, other large parking lots—include the Pheasant Lane Mall excess parking area in Tyngsborough	1	High	
6. Public Education Package	MAGIC Chairman	There's a need for a more visible public information campaign to convince people of the benefits of using transit and paratransit modes.	Develop materials for distribution in town halls, elsewhere, on benefits of, opportunities for, ride-sharing	1	Moderate/Low	(CARAVAN is responsible agency)
7. Barriers to TMA Success	MAGIC Chairman	Need to identify obstacles preventing TMAs from recruiting members, being successful	Documentation of experience in existing TMAs, possibly survey of TMA directors	4	Moderate/Low	Would rely heavily on info from CARAVAN, 128 BC, others
8. Tax Increment Financing	MAGIC Chairman	Work with communities to facilitate multimodal traffic/transit improvements when TIF is used by new or expanding businesses		(no rating)		See **C.4**
9. Bicycle connection through Carlisle	Carlisle MAGIC representative	A bicycle path connecting the Minuteman Bikeway in Bedford and the Bruce Freeman Trail (Sudbury to Chelmsford) along Route 4/225 and through Carlisle Center would provide a long unbroken route for recreational and commuting cyclists.	Feasibility study of a bicycle connection within the existing right-of-way and/or beyond.	2	Moderate	

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	MAGIC Committee Rating	Relation to Congestion Mgmt.	CTPS Applicability
E. ROADWAY SAFETY IMPROVEMENTS						
1. Consolidation of curb cuts at Route 117 retail area, Stow	Stow Planner	Town is negotiating with owner to provide internal circulation roadways to eliminate excessive curb cuts.	Traffic analysis of improvement concepts	5A	Moderate—but not clear if help needed	
2. "Terrible Triangle," Maynard	Maynard Planner	Intersection of Route 27 at Concord Avenue provides poor circulation, believed to be high-accident location.	Circulation/accident studies	5B	High	Redesign already in construction; no role for CTPS
3. Route 2A (Acton) safety improvements	Acton Planner	Town would like to see coordinated plan for corridor, including left-turn lane(s) for development traffic	Corridor study	2	High	
4. Barriers to alternative solutions	MAGIC Chairman	Need to identify [barriers] to pursuing promising options. Need to work on suburban/rural design standards to prevent use of urban design in MAGIC communities.	Types of barriers not defined, other than design standards issue.	1		Committee to develop alternate design standards already exists; no additional role for CTPS
5. Intersection of Lower Main Street & Wilkins Street, Hudson	MAGIC Chairman	Signalized intersection with poor geometry	Already included in "Congested Intersection" Study	5C	Moderate	Already included in "Congested Intersection" Study
F. OTHER ROADWAY IMPROVEMENTS, IDENTIFIED BY TOWN OFFICIALS						
1. Massachusetts Avenue/ Waltham Street intersection, Lexington	Lexington Economic Devel. Coordinator	Congested local intersection could benefit from study.	Already included in "Congested Intersection" study	5D	High	Already included in "Congested Intersection" study
2. Downtown Rotary, Hudson	Hudson Asst. Town Admin.	Chronic traffic congestion at rotary (Main and Washington Streets), but with limited improvement possibilities.	Congested intersection-type study	5E	Moderate/Low	
3. Massachusetts Avenue/Route 4-225 (near Wilson Farms), Lexington	Lexington Planner	Unsignalized intersection with heavy demand—should be considered for signal.	Traffic signal warrant study	5F	High	

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	MAGIC Committee Rating	Relation to Congestion Mgmt.	CTPS Applicability
4. Route 117/ Wataquadock Hill Road intersection, Bolton	Bolton Town Coordinator	Intersection is badly configured, in need of improvements	Already included in “Congested intersection” study	5H	High	Already included in “Congested Intersection” study
5. Route 117/Forbush Mill Road intersection	Bolton Town Coordinator	Intersection badly configured, heavy traffic at donut shop, needs improvements	Congested intersection-type study	5I	Moderate/Low	
6. Route 2 traffic	MAGIC Chairman	Study how to facilitate “smart” growth of this fledgling node to accommodate the growth potential along the corridor *(sic)*	(Not clear what is being requested)	3		
7. Routes 27, 111, 62, 85, 117 and 119	MAGIC Chairman	Corridor study of these local arterials. Update 117 corridor study to include Cisco.	Route 27 [Acton] corridor study already underway by Town. Conclusions of Route 117 study unlikely to change because of Cisco. Others may be explored as appropriate.	4		
8. Hanscom access	MAGIC Chairman	Route to Hanscom is not easily accessible by car; LOS is F or worse during peak periods	Major Investment Study or feasibility study	5G		
G. MISCELLANEOUS OTHER						
1. West Street cut-through traffic	Carlisle Town Planner	Cut-through traffic from other towns use Carlisle roads to bypass Route 3 and Route 4/225. Roads aren’t designed to handle through traffic.	Identification of local cut-through demand on West Street—potential diversion or reduction strategies, and ways to reduce queues at Route 4/225 intersection with Route 27	(no rating)	High/ Moderate	
2. Concord cut-through traffic	Concord Town Planner	Town has similar concerns to Carlisle (see **G.1**)—traffic from the north using Concord roads to avoid Route 3 and Route 4/225. Has installed 4-way stop sign at one location to address, resulting in long intersection queues.	Study of effectiveness of measures already applied, and additional strategies to divert, reduce, or otherwise handle cut-through traffic	(no rating)	High/ Moderate	

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	MAGIC Committee Rating	Relation to Congestion Mgmt.	CTPS Applicability
3. Parking studies, downtown Hudson	Hudson Asst. Administrator	Parking inadequacies downtown are a chronic complaint; Town willing to add parking, but needs information about nature of problem	Parking study to identify occupancy, parking duration, parking purposes, etc.	(no rating)	Low	
4. Before-and-after study, pending I-495 area developments	MAGIC Chairman	General concern among MAGIC communities about far-reaching impacts of large-scale developments along I-495.	Traffic counts, etc., to identify areawide traffic impacts of major new developments along I-495	(no rating)	Moderate	Development impact study included in MAPC's TCSP grant
5. Parking Study, Phase II, Lexington	Lexington Economic Development Coordinator	Follow-on work from Phase I parking study, about to be completed by consultant.	Needs more discussion with Town to clarify needs	(no rating)	Moderate	
6. North-south travel deficiencies	MAGIC Chairman	Investigation of improvement options to facilitate north-south travel within MAGIC communities	Feasibility study or Major Investment Study	(no rating)	Moderate	
7. Advisory group for general MAGIC transportation issues	MAGIC Chairman	Desire for ongoing review of transportation status within MAGIC	Creation of group like Route 2 CAC, for general MAGIC oversight	(no rating)	(Isn't this what MAGIC Committee does now?)	Not a CTPS issue except when project-based

(NOTE: Shaded rows represent CTPS recommended actions for Phase II. Only a small number of these may be included in current year, because of funding limitations. Ratings were provided by MAGIC Committee as of September 2001.)

6. OBSERVATIONS AND CONCLUSIONS

- MAGIC communities are recorded as having high housing costs and high auto ownership levels, compared with other towns within the Commonwealth. This was demonstrably true in the 1990 Census results, and most likely will remain true when the comparable results of the 2000 Census become known.

- Industrial development is occurring at a rapid pace on the western end of the MAGIC area, on land previously undeveloped and located close to I-495. This is the most vulnerable area in terms of increasing traffic congestion, increased demand for housing and ancillary commercial services, and other forms of development which will themselves give rise to additional traffic demand. Industrial development is *not* occurring at a rapid pace in the eastern portion of the subregion (with the exception of Bedford), primarily because the industrially-zoned areas with reasonable highway access are already close to buildout. Bedford, along with Billerica and Burlington, continues to add and to welcome large-scale industrial development at suburban "office park"-type densities. Bedford does have a maximum as well as a minimum allowable parking requirement, however, which may help to reduce vehicle trips at particular sites if it represents a "binding constraint" on new developments.

- The high price of land and large-lot, single-family housing in the MAGIC communities, including the more westerly communities, makes it difficult for this area to provide housing affordable to employees of the new industrial developments appearing along I-495. The most likely locations for new housing to support these corporations will be the areas west of I-495, as well as southern New Hampshire. The 2000 Census Journey-to-Work data, when it is published, is likely to show evidence of a residential shift westward and northward for employees of firms newly located in the westerly MAGIC communities.

- The high cost and low relative convenience of traditional transit-type services make them inappropriate to serve all but a handful of work trips generated by these new businesses. There are certain exceptions to this:

  (a) As retail and commercial services expand to serve new industries (e.g., hotels, restaurants, small shopping centers), they generate the demand for part-time, relatively low-income service workers. Most of these will have cars and prefer to use them, but some may benefit from limited paratransit-type service. When such needs are identified and specifically targeted, directed services may be created to serve these needs (e.g., the Bedford supermarket which contracts to provide a bus for Lowell High School students working the afternoon cash-register shifts).

  (b) Commuter rail is a popular mode for trips into Boston and to intermediate destinations (Waltham, Cambridge). It seems likely that a smaller share of overall work trips from this area will have central city destinations in the future, as suburban industry expands; but commuter rail will remain the preferred option for such work trips. Additional parking is needed at suburban stations along the Fitchburg line. A station in Littleton—either an expansion of the existing site, or a new station on a nearby site—would provide some relief to parking demand at South Acton, but would not obviate the need for inbound station parking expansion or supplementary feeder service as well. The practicality of providing such feeder service to other stations, in conjunction with Littleton station improvements, might profitably be investigated for commuters from Stow as well as from North Acton and parts of Concord, particularly if the new shuttle service from Maynard proves to be successful. The outlook is not very promising for reverse commuting service via rail, however. Such service has little or no potential to serve more than a small fraction of travelers, even if capital investments were made at disproportionately high cost to allow such service; and it would have no discernible benefits in terms of reduced traffic congestion, employer recruitment, or other societal objectives.

(c) Large single-employer sites (at least 100 and preferably 500 or more employees) are the most promising sites for vanpool and carpool formation, particularly with an enthusiastic employer as sponsor. Such employers always represent the most important factor in determining the success of ride-sharing and transit promotional measures within corporate settings. Employers who have a vested interest in reducing employee "drive-alone" commuting may opt to provide shuttles to connect their sites with existing transit stations, *if convenient stations are nearby and offer good connections to the larger transit network.* Employers who provide abundant parking, who are not short of land for expansion, and who locate close to regional roadway facilities expect that their employees will choose their own commuting behavior without influence or incentives from employers; and they usually offer only token endorsements of such programs. It is not surprising that most of the MAGIC area employees for whom data are available report "drive-alone" percentages of 92 percent or more to DEP.

- Provision of additional park-and-ride lots for carpool amalgamation (and as potential future bus stops for locally-sponsored transit services) should be investigated, beginning with a lot on I-495 at Route 117 in Bolton. Other lots might be sited on vacant parcels along I-495 or Route 2; or by agreement with shopping center proprietors within the MAGIC communities.

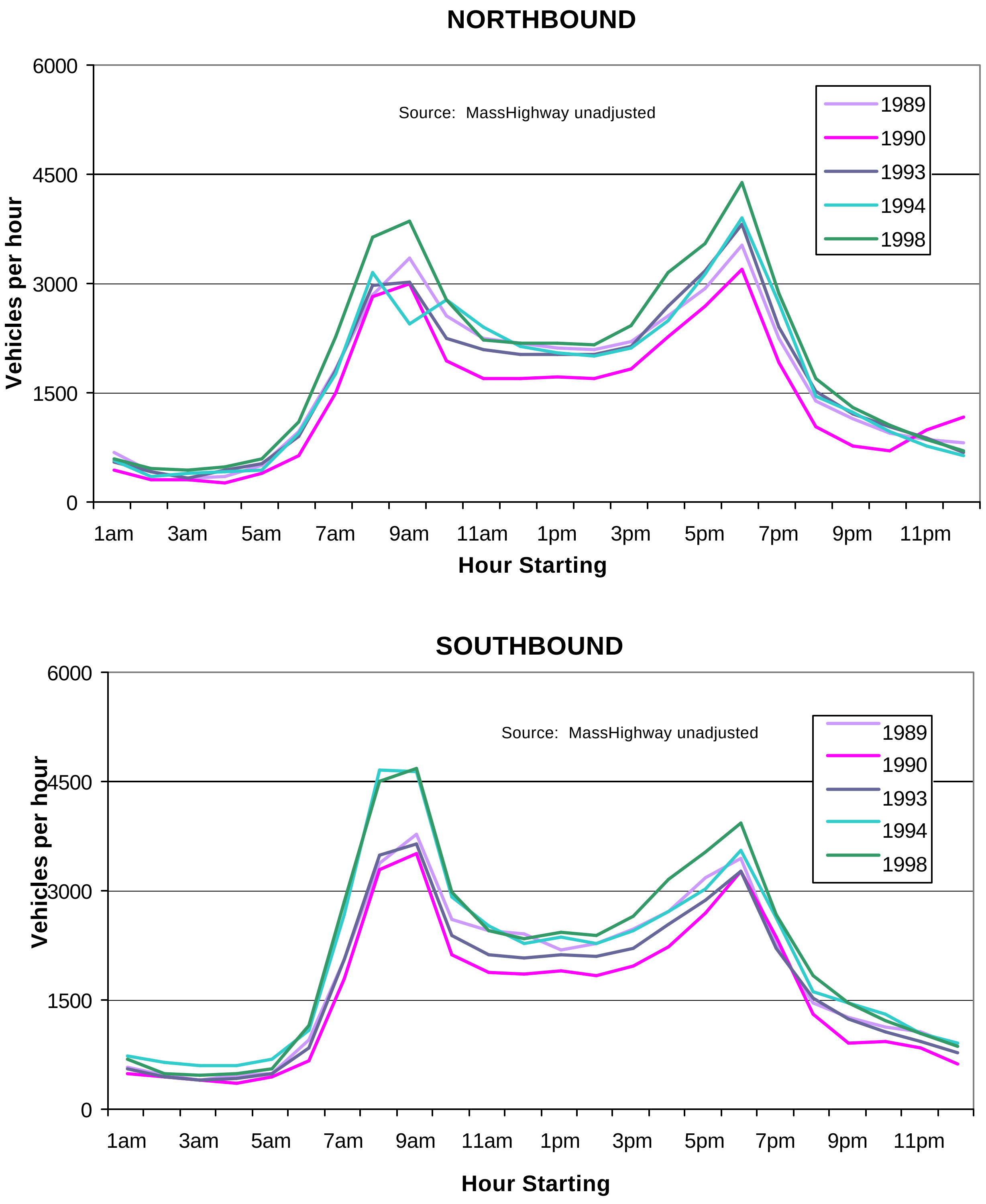
- In addition to expansion of transit-type services, MAGIC representatives are interested in bicycle and pedestrian amenities. CTPS can contribute to advancing rail-trail conversion efforts by evaluating proposed trails and making recommendations for routes, detours, and needed improvements.

- A number of suggestions made by town officials are recommended for inclusion in a longer-term CTPS work program, including studies of left-turn accommodation along Route 2A in Acton and Littleton, and the Route 62 corridor between Acton and Concord.

- It would be more appropriate in the future to group the towns differently for transportation study purposes: effectively, Lexington and Bedford are similar, with similar issues; they might be combined with Burlington, Woburn and other Route 128 abutters. Littleton, Boxborough, Hudson and to a lesser extent Bolton share issues related to I-495, and might better be grouped with other I-495 abutters such as Marlborough; while Maynard, Acton, Stow, Concord and Carlisle have north-south travel issues which are different from the other towns. Issues related to service improvements, parking expansion, and other Fitchburg Line issues, are of most applicability to the towns located along that line. These communities should work with the MBTA on opportunities for modifying and/or improving commuter service on the line.

APPENDIX A

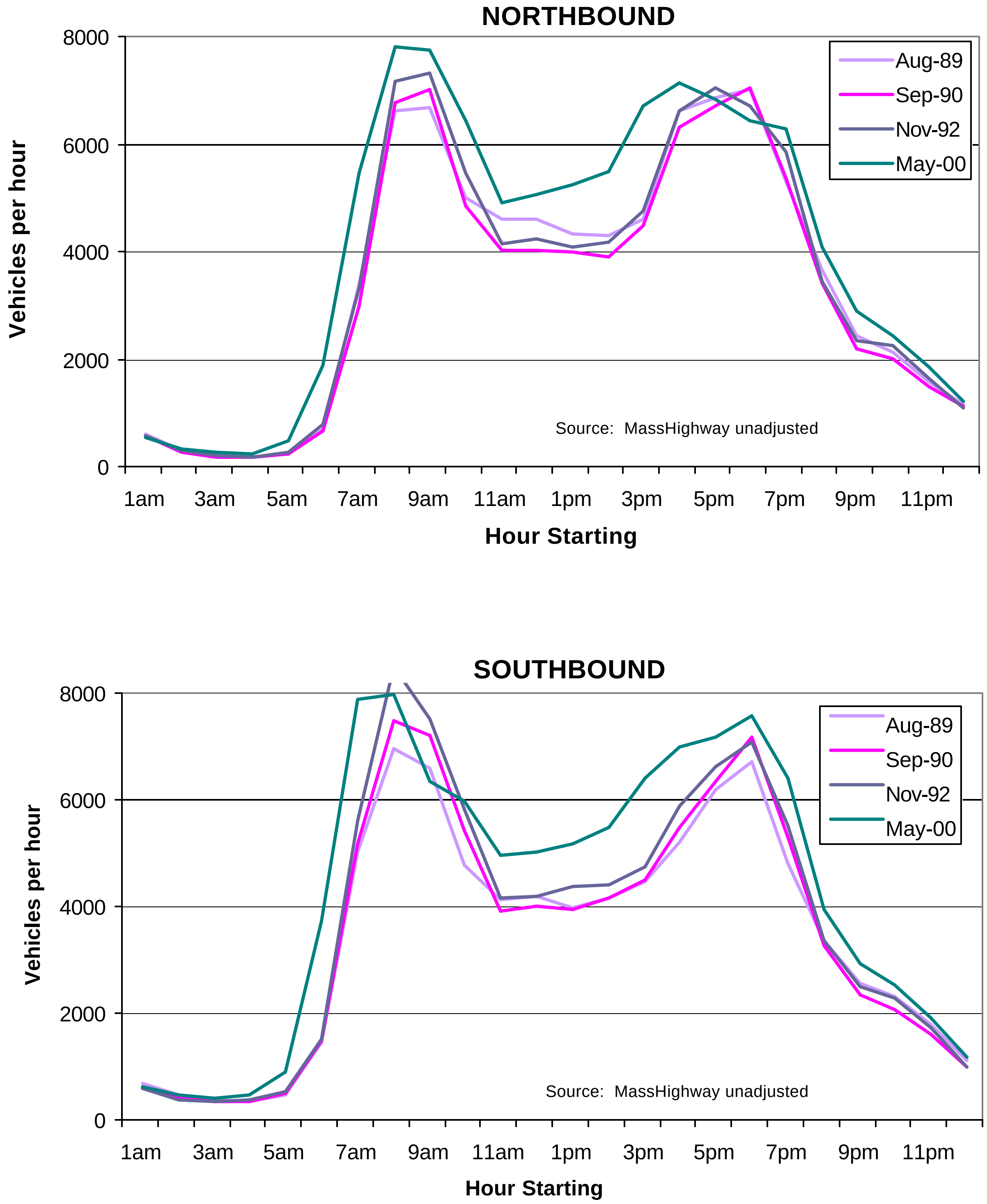
Historic Traffic Volumes on Selected MAGIC Subregion Roadways



CTPS

MAGIC
Subregional
Area Study

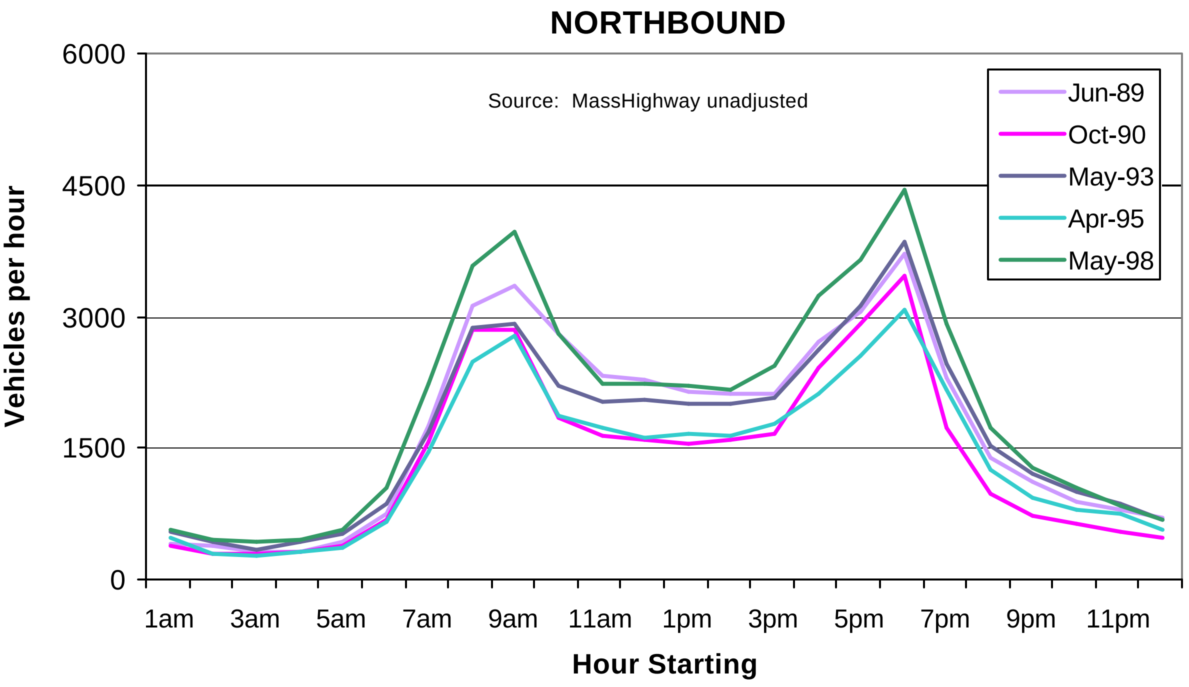
Figure A-1
Historic Traffic on I-495, Southborough

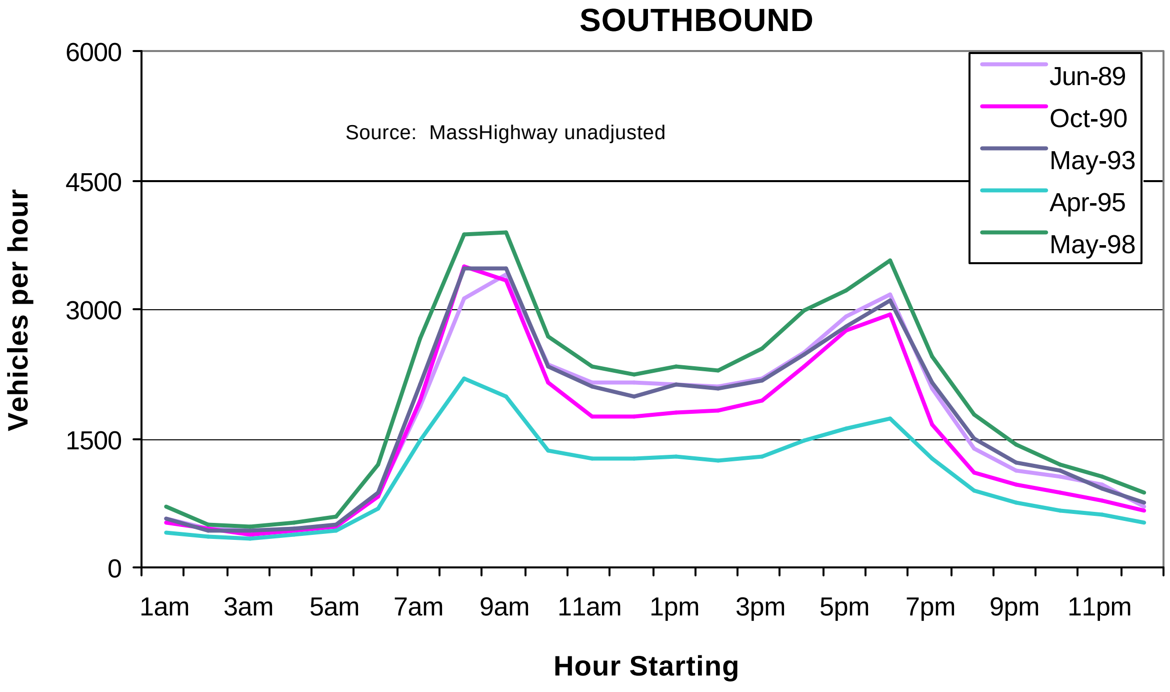


CTPS

MAGIC
Subregional
Area Study

Figure A-2
Historic Traffic on I-95, Lexington, North of Route 2A

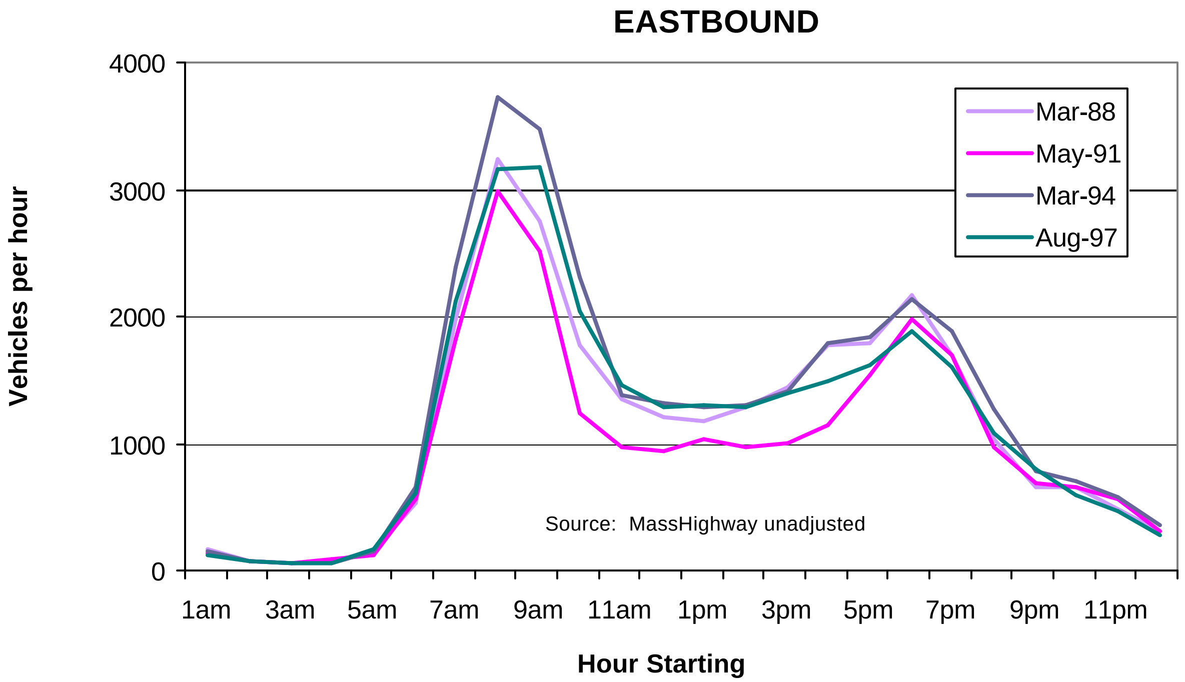


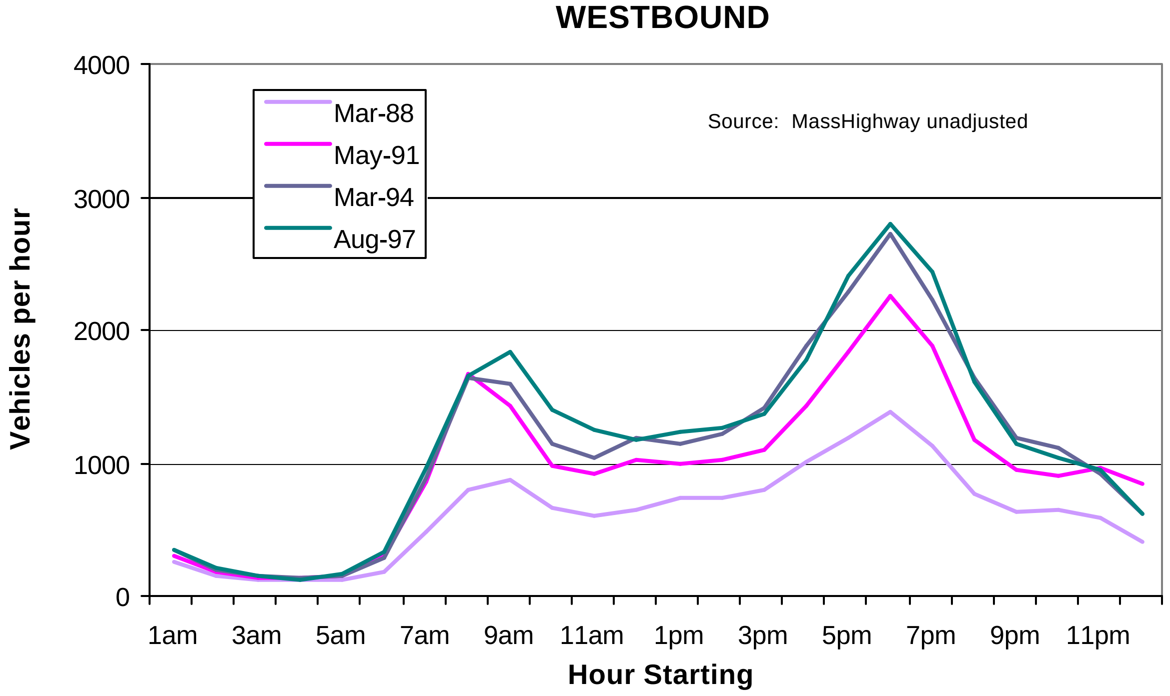


CTPS

MAGIC
Subregional
Area Study

Figure A-3
Historic Traffic, I-495, Littleton
S of Route 2

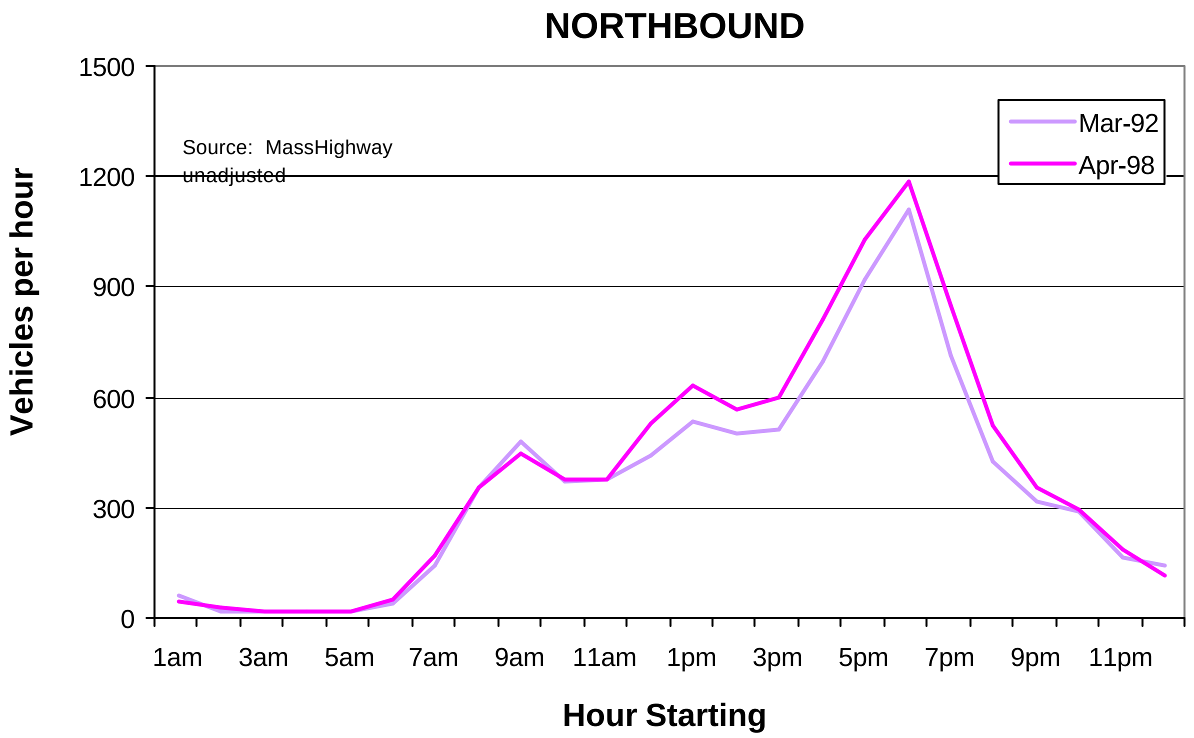


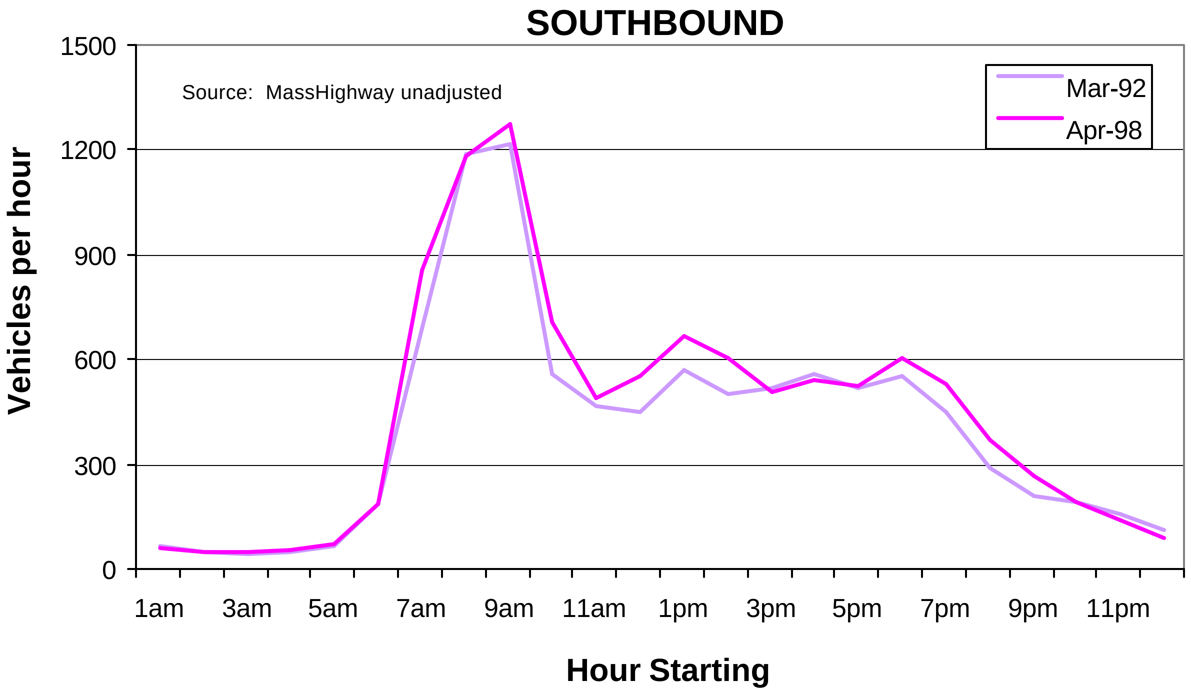


CTPS

MAGIC
Subregional
Area Study

Figure A-4
Historic Traffic, Route 2 at
Lincoln/Lexington Town Line

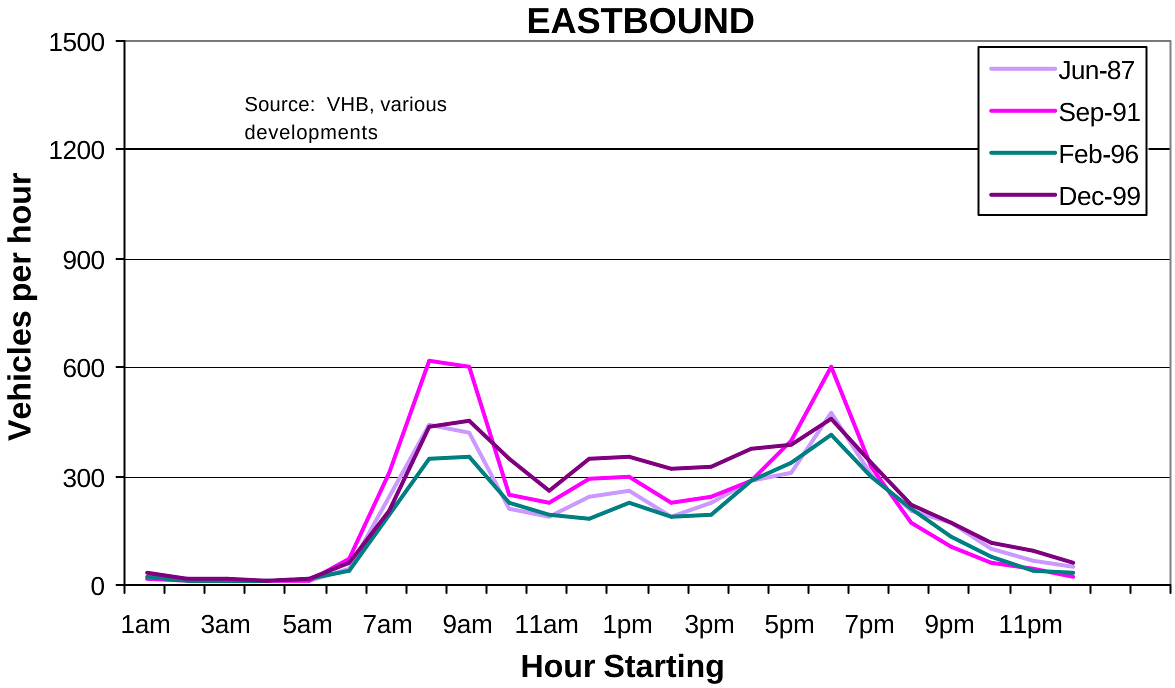


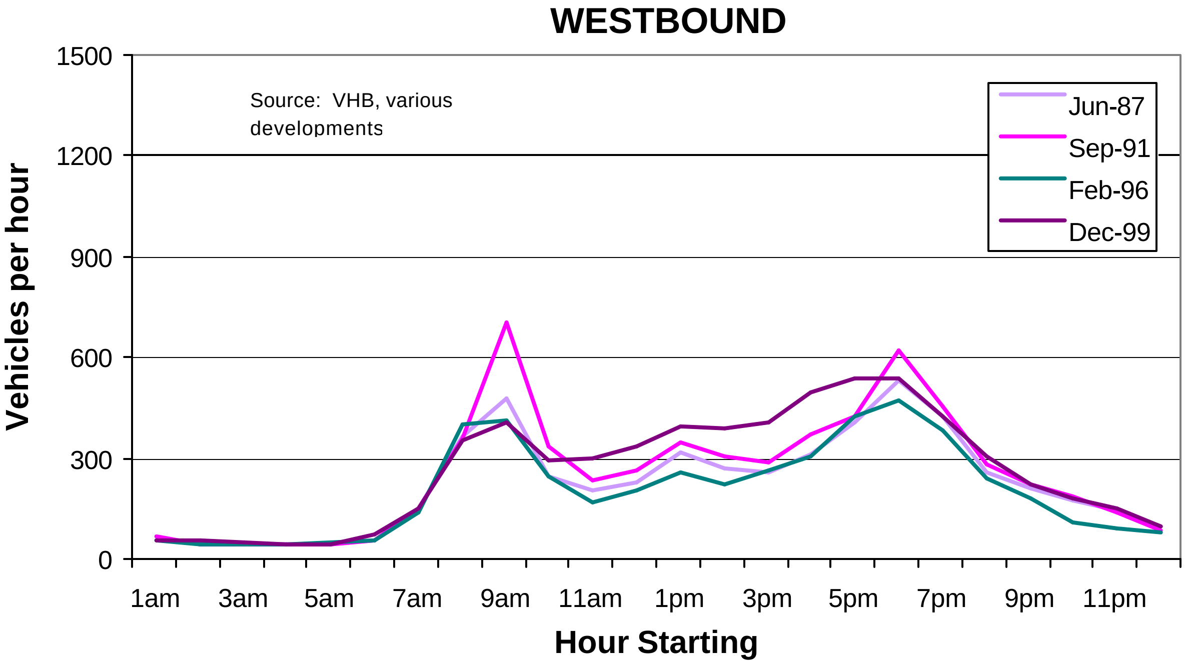


CTPS

MAGIC
Subregional
Area Study

Figure A-5
Historic Traffic on Route 2A/119,
Acton-Littleton Town Line

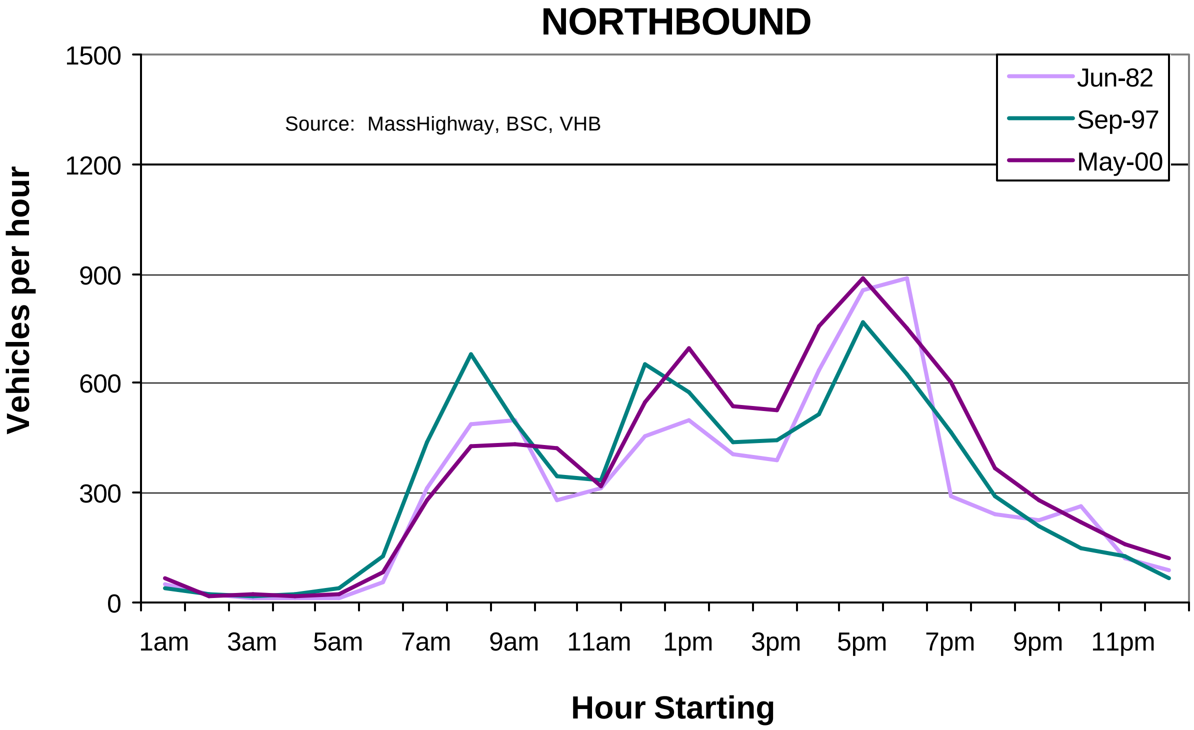


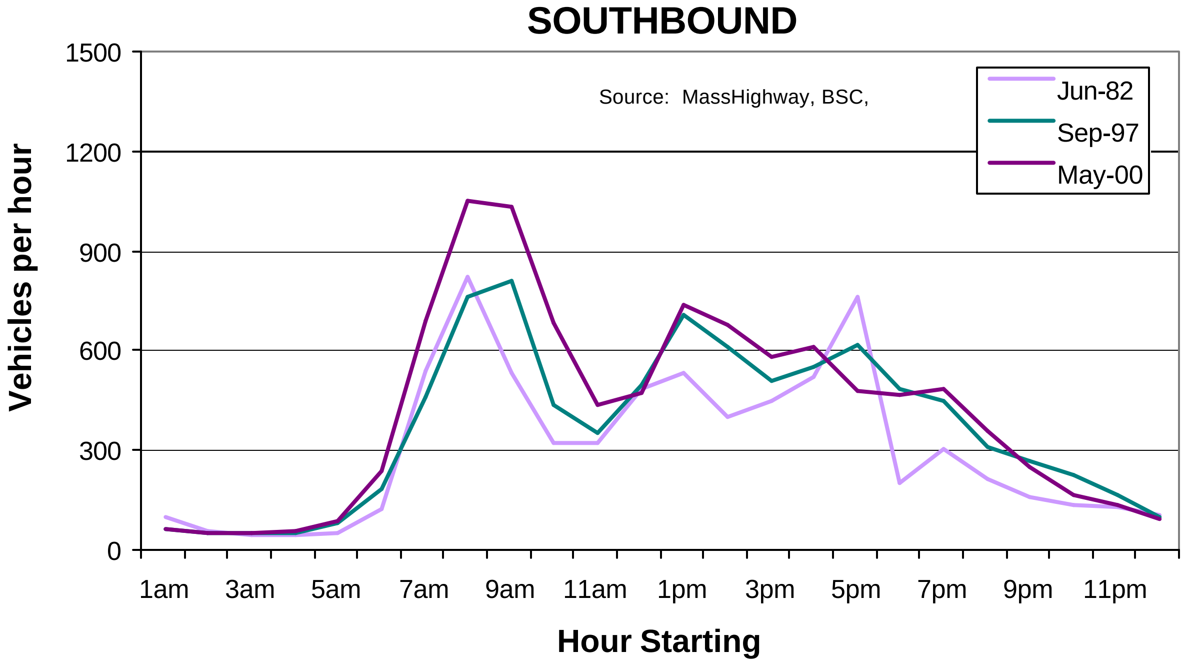


CTPS

MAGIC
Subregional
Area Study

Figure A-6
Historic Traffic on Route 111, Boxborough, E
of I-495 Ramps





CTPS

MAGIC
Subregional
Area Study

Figure A-7
Historic Traffic on Middlesex
Turnpike N of Route 62, Bedford

APPENDIX B

Comments on Draft Phase I Report

1. Karen Duggan McNamara, Town of Littleton (submitted 7/11/01)
   --with responses
2. **Table 5-1**, revised/rated by MAGIC Committee (submitted 9/25/01)
3. Roland Bartl, Acton Town Planner (by e-mail, 9/26/01)
   --with response
4. Elizabeth Newman, Concord Town Planner (by e-mail, 10/15/01)
   --with response
5. Judy Alland, MAPC MAGIC Coordinator (by e-mail, 12/7/01)
   --with responses

1. Karen Duggan McNamara, Town of Littleton

Comments on the MAGIC Subregional Area Study: Draft, Phase 1 Report
Karen Duggan McNamara, Littleton

Pages 6 & 8 Employment tables
The numbers for Littleton in 1999 (page 6) and 2000 (page 8) appear to contradict each other. Did employment go from 5342 ('99) to 5835 ('(99) back down to 5279 (2000)? Ⓐ

Page 16, last paragraph, second sentence:
Would suggest it be changed from

> "When large-scale expansion occurs on the scale of that currently being pursued by Littleton, Boxborough, and other towns along I-495, the state is virtually powerless to prevent such development, and so are regional agencies…"

to the following…

> "When large-scale expansion occurs on the scale of that currently being pursued **in** Littleton, Boxborough, and other towns along I-495, **the state presents smaller communities with conflicting responses.** Ⓑ
>
> - **On the one hand, the Economic Development agencies strongly encourage small towns to support the job creation that major development projects bring.**
> - **On the other hand, the transportation agencies, provide no additional support, and, in fact are canceling or indefinitely delaying the most basic safety projects that were already planned before proposed expansion became part of the picture."**

Regional groups, such as MAGIC, the 495 Initiative, or the MPO can give small communities some visibility but, until the state's transportation agencies develop a coordinated process, small towns are left in situations that are often less than optimal for all concerned.

Page 4, on list of Littleton projects:

ID	Title	Type	Size	Comment
14	Matawanakee	Res.	40 Units	This is town water going into a 50 year old neighborhood. Should it be on this list?
29	High School	School/Private		This is the PUBLIC high school.

Ⓒ

Pages 25-28
Don't accept the premise that the study must stay with 1990 census data. MAGIC has done significant work since 1990 AND CTPS has data collected for them and analyzed by them in the mid 1990s. Ⓓ

Page 29, last paragraph:
Would suggest changing

> "… are partial cloverleaf interchanges which until recent years have been more than adequate to serve demand." Ⓔ

to:

> "… are partial cloverleaf interchanges, **some of** which, until recent years have been more than adequate to serve demand." **Others, such as Rt. 119 at Littleton Common and Rt. 117 in Bolton, have been inadequate since the days of Digital.**

Page 30 – 32 General comments:
Using various data at CTPS, which have been collected by Police chiefs at MBTA parking facilities, may help enhance the models used. (Or, can we assume that the models for this work did use data collected over the 1990s?) I fully agree that the trips generated outside 495 are an important contributor to the traffic. While some of this is coming from NH, a significant portion is coming from MAPC sister organizations in based in Lowell, Fitchburg, and Worcester. I expect more use of data from these sources. Ⓕ

Page 39, third paragraph:

- Expand "This idea is supported by other jtowns…" to "This idea is supported by **over twenty other towns along the Rt. 2 and Rt. 495 corridors".** Also, if I may speak for Acton and Concord, these towns, and others along the Fitchburg line, support the proposed Littleton station because all current parking is being "invaded" by residents from other towns. It is not clear that either is against expanded parking if it were necessary for the town's own residents.
- Pull "environmentally sensitive" and replace **with "… over 80 acres, some of which have significant environmental concerns".**

Page 39, last paragraph:
Change the first sentence to: **"A new station in Littleton would provide significant relief to parking demand in South Acton, Concord, and Alewife.**
Change or eliminate the last sentence. When a new station is built in Littleton, it will have double tracks and expanded service. This paragraph can either state that or state that it assumes that. Ⓖ

Page 43, second sentence:
Add, if you wish, "Because of the limited parking and service in Littleton today, the downtown Lowell station is used by numerous MAGIC residents including people in Littleton." Ⓗ

Page 55:
Somewhere in this section, one would expect a fairly long dissertation on The Great Road of Rt. 119/2A as it goes from Groton through Littleton and then into (7) Acton on this page. The volume is significant and growing far faster than population within MAGIC. (Need data from Lowell to get full picture OR possibly come out and see it any morning or evening). The impact of this and increase on 495 and partial clover configuration at 495 all contribute to significant problems at the 110/2A/119 light in the center of Littleton. Ⓘ

This section is also missing the increasing traffic on 2A/110 as it crosses 495 in Littleton. The same increases west of 495, combined with significant activity at Devens is fueling all of this. Given the significant delays in planned safety improvements less than a quarter mile from the new High School (approximately one mile west of 495), this has become a very major issue between Littleton and Mass Highway.

While I agree with the assessment of the 290 problem and others in this section, the safety issues on these secondary roads in Littleton, Acton (and 117 in Bolton as well) should outweigh the "flow" concerns of planners when it comes to identifying and planning for congestion.

Page 58:
Think there is a 2A Littleton project missing in section B. Ⓙ

Page 73:
I would insert a third bullet or second paragraph to the second bullet as follows…

"While growth and dependency on cars grows faster along 495 towns, the support of Mass Highway has declined. Normal upgrades, such as the straightening of dangerous intersections and the upgrade of traffic lights, drop out of plans and come back in as arrangements between Mass Highway and major development entities. Towns have little or no say in these arrangements, even after repeated requests. Ⓚ

"There is an increasing gap between accelerated growth and diminished highway maintenance, never mind needed enhancements to begin to address the growth. The safety issues are becoming more evident in highway incidents requiring emergency personnel."

Page 74:
Second last paragraph: I don't agree with "little interest". It may be that the lack of action by Mass Highway to repeated studies and planned improvements is what is needed. Ⓛ

Last paragraph: I agree.

Final comments:
If CTPS is using data collected by other planning organizations, it isn't as clear as it might be. If it isn't, given the growth on 495, it needs to be. Ⓜ

Recognition needs to be made of the inherent problems of small towns dealing with state agencies. If planning is now looking to 495 and beyond to I190, then this becomes more important. Decisions in small towns are made by people who work full time someplace else doing a wide variety of interesting but non-government activities. When these people come together on a Planning Board or Board of Selectmen, they do so with certain expectations. They don't expect to "baby sit" state agencies once plans are agreed to. Given the time they put into local government, they don't expect paid professionals in state agencies (Mass Highway or MBTA) to work around or against local government.

(Note: original retyped by CTPS for conversion to PDF format, February 20, 2002).

RESPONSES TO COMMENTS BY:
Karen Duggan McNamara, Littleton

Comment	Response
A	The numbers on Page 8 (Table 2-3) were *forecasts* for year 2000, developed in advance of that year by MAPC. If actual employment totals were currently available from the Department of Employment and Training, these would be included in Table 2-3 as a substitute for the forecasts. However, these data, which show 1999 actual employment in Littleton at 5,835, are not yet available. Consequently, and to avoid confusion, Year 2000 has been dropped from Table 2-3.
B	We can't speak for the State's economic development agencies, but the transportation agencies are working expeditiously, within funding, environmental, and public acceptability constraints, to build committed projects and to advance additional projects through the planning pipeline. We believe that the economic development agencies similarly work to encourage appropriate kinds of private economic development, and to channel development into areas which can support, and which welcome, such growth. State agencies cannot *prevent* large-scale development projects in areas which are inappropriate, or ill-equipped with infrastructure to support large-scale development; particularly when these are encouraged by towns. Nor can State agencies come to the rescue when out-of-scale private developments create the need for public infrastructure investments which can't be accommodated without exceeding the above constraints. Through MEPA and other environmental review agencies, the State can only try to limit the impacts of large private development projects—an important mission, particularly when such impacts cross town boundaries. In addition, the State must hold both developers and approving towns accountable for at least part of the costs of the capital improvements required to accommodate such developments.
C	Matawanakee (left on list—not sure why it should be removed) High School changed to Public High School
D	Although there has been data collection since the 1990[1] Census, we are unaware of any other comprehensive source of survey data on home origins of work trips into MAGIC communities. Surveys of individual companies may have been done by private consultants, and the results submitted in fulfillment of DEP requirements. These data generally are not available to us, and would not be representative of areawide conditions in any case. The Year 2000 Census Journey to Work survey data is not expected to be released until mid- to late 2002. While we wait for this data, the best we can do is assume that our regional model gives an adequate representation of trip origins, as was done for the select-link analysis presented later in the report.

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[1] A good deal of this has been performed by CTPS, for Route 2 area and other studies. In addition, a home-interview survey was conducted during 1991, which obtained data from a sample of 3,881 households for purposes of validating one component of the regional model set. Unfortunately, the costs of such data collection are extremely high: the 1991 survey was limited in sample size because of high costs, so that areawide origin-destination information could not be extracted from this data with reasonable statistical validity. The high cost of trying to achieve such statistical reliability is the main reason why there is so much reliance on Census Journey-to-Work data by planners in this field.

E	The traffic count data available from earlier years is limited, but it suggests traffic volumes at these interchanges were low enough not to overwhelm the capacity of partial cloverleaf interchanges in the past.
F	The models used for the select-link analysis are calibrated to match the most recent traffic counts collected at each of the reported count points. The trip tables by the model to the existing roadway network are based on current population, employment and household estimates, and include such assumptions for the adjacent planning regions and adjacent states. However, except for MBTA surveys of train riders, license-plate surveys at park-ride lots, and other such *site-specific* data-gathering efforts, there simply is no region-wide data on trip origins and destinations until the 2000 Census is available.
G	The writer's views regarding a proposed new train station are hereby respectfully acknowledged. It is our understanding that the entire area is considered "environmentally sensitive," to a greater or lesser degree. At the same time, there have been no studies to date which demonstrate that a new station at Littleton would provide "significant relief" to parking congestion at South Acton. Also, it is not clear at present that provision of a new station would imply a commitment to double-tracking the Fitchburg Line beyond South Acton.
H	No MAGIC residents were recorded in the 1993 commuter rail survey as boarding commuter rail at Lowell (although Westford, Chelmsford and Dracut were represented). It may be that this has changed since that time, but we have no evidence to support this.
I	This section of the report specifically addresses previous Congestion Management planning efforts and their findings. The portion of Route 2A/119 in Littleton was not explicitly identified as a Congestion Management problem area as were the sections in Acton, Concord and Lexington, either through speed run data or public comments. However, we are happy to include it in a list of problem areas identified by residents. Also, if a study of the Route 2A corridor east of Littleton is initiated, under Phase II or later, the Littleton section will be included. Not clear what is the "290 problem" referred to, apart from the study recently conducted by MassHighway in Hudson.
J	There don't appear to be any Route 2A projects programmed in the current TIP for Littleton. There *is* a resurfacing project on Route 2A[2] included on the so-called Supplemental List (as Appendix C in the current TIP document), but this is a local project, not currently programmed.
K	The writer's views are hereby respectfully acknowledged.
L	Previous text[3] changed; in fairness, it probably does not reflect a consensus of the MAGIC group. We do appreciate all suggestions regarding worthwhile roadway *and* transit/paratransit projects.
M	CTPS does, indeed, use data of other planning organizations, in addition to generating data ourselves. As illustrated frequently during the study, only limited data has relevance to the specific questions of concern to MAGIC members; and that data frequently needs to be generated or extensively validated in order to be used reliably.

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[2] Projis #602751

[3] "MAGIC members exhibit little interest in studies which evaluate existing roadway deficiencies and suggest improvements. However,…"

2. Table 5-1, revised/ranked by MAGIC Committee

MAGIC Subregion Study: List of Potential Projects & Studies – Revised & Ranked (7/01)

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	Rank	CTPS Applicability
A. SHUTTLE SERVICES & LOCAL BUS/PARATRANSIT SERVICES					
1. Improvements to Clocktower shuttles	MAGIC	Possibilities for expansion of existing shuttles serving South Acton train station		2A	(Town proposals shuttles already under review-perhaps we can evaluate once in operation?)
2. Improve currently underutilized or inefficient services	MAGIC	Existing services need to be monitored-at present, there's little information about what's operating and how well it works	Expand ride-check program, create reporting mechanism, develop measures of effectiveness for evaluating shuttle-type services	2	
3. Regional Parking Lots	MAGIC	Provide park & ride in existing parking lots to be serviced by shuttle		1	
4. Potential for bus service connecting Stow with Acton CR station.	Stow Planner	Inadequate parking at Acton CR station to serve demand from Stow commuters. Feeder bus service would potentially address.	Assess demand, likely success of bus service to Acton train station	3A	
5. Bedford Local Bus	MAGIC	Possibilities for expansion of existing (mainly e/h) service and tie in with other nearby local services	(Service examined as part of present study-limited potential for expansion as currently defined)	3B	
6. Concord Local Bus	???	Existing town-owned large-size bus(may be) underutilized	Identify other potential uses for existing bus (such as shuttle to train?)	3C	
7. Lexington Tourism Shuttle	Lexington Economic Develop. Coordinator	Interest in expanding LEXPRESS to add dedicated line to serve Lexington historical sites (taverns, Museum of our National Heritage, Minuteman National Historic Park), and connect visitors (both in cars and in tour buses) with the best attractions, parking, and services	Evaluation of existing services; examination of potential to add or divert LEXPRESS routes.	2B	CTPS has expertise in this area, if NPS/ Town of Lexington/ LEXPRESS operators are amenable

B. COMMUTER RAIL-RELATED IMPROVEMENTS					
1. Parking expansion alternatives for South Acton Station	Acton Planner (Stow Planner- see below)	Town concerned about severe parking shortage at South Acton station but ambivalent about expand parking supply because of increased out-of-town traffic	Identification of strategies to reduce demand for parking while maintaining attractiveness of rail use	1B	
2. New Littleton CR station at Route 2/ I-495	Littleton/ Acton/ Concord planners	General interest among all communities in large new CR station along Route 2 corridor to relieve overcrowding at downstream parking lots	Feasibility study for alternative station sites? (MassHighway project- new ENF about to be issued-at best, we'd support consultants)	1A	(If consult ant under contract, may not be a role for us)
3. Lincoln town center	Lincoln ExecSecy/ PIng Board Secy	Town trying to relocate post office, reconfigure downtown, conflicting demands for parking between train station and mall	Parking demand study related to joint use of lot by commuter rail patrons/ shoppers	1C	
4. Commuter rail schedule modifications	Clocktower Place	Current train schedules have few options for commuters in reverse-peak direction. Would like to explore more reverse-commute service.	Feasibility study? Demand study? Work cooperatively with Devens, I-495 Initiative & Legislators on reverse-commute problem.	3	(Feasibility already being addressed as part of "reverse- commute" study)
5. Regional Parking Lots	MAGIC	Provide park & ride spaces in existing parking lots, serviced by shuttle		1	
6. "Reverse commute" - experience and other non-rail opportunities	MAGIC	Documentation of reverse-commute activities (successful and unsuccessful); identify other alternatives to facilitate reverse- commuting within MAGIC including adding more rolling stock.	Additional reverse- commute studies, survey existing riders, determine characteristics of transit reverse-commuters	2	

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	Rank	CTPS Applicability
C. TRANSPORTATION MANAGEMENT ASSOCIATIONS (TMA)					
1. Hanscom-based TMA	Hanscom Planner MAGIC	AFB interested in facilitating TMA efforts, exploring additional strategies	Assist AFB, Field, in designing or evaluating TMA-type strategies	1	(Not typically CTPS activity- CARAVAN is best option)
2. “Super TMA" in area around Bedford, dealing with employee transportation	MAGIC Rep Bedford	Interest in creating a quasi-Transportation Authority or super TMA to serve the interests of employers and general public (employees could ride "free" by showing company ID's; public would pay fares). Functions of services would be to interface with the MBTA transit resources and to provide intra- and inter-town mobility.	Creation of TMA or local authority to fulfill these functions.	2	(Not clear how CTPS could help- need to apply for funding through TMA program)
3. Development of a Baker Avenue TMA, with associated ride-sharing/transit	Concord Planner	Development is proceeding at the Baker Avenue industrial area, and Concord is encouraging TMA-type activity there. But difficult to achieve for multi-tenant sites.	Support to TMA organizational efforts, with analysis of, e.g., shuttles to Concord train station, other strategies	3	(CTPS doesn’t organize TMAs, but can work in encouragement support of organizers)
4. Barriers to TMA Success	MAGIC	Need to identify obstacles preventing TMAs from recruiting members, being successful and focus attention on single sites with multiple businesses.	Survey? Documentation of experience in - existing TMAs?	4	(Would rely heavily on info from Caravan, 128 BC, others)

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	Rank	CTPS Applicability
D. RIDE-SHARING/BICYCLE/PEDESTRIAN IMPROVEMENT PROJECTS					
1. Bicycle paths along Routes 117 and 62, Stow	Stow Planner	Town hoping to promote greater bicycle use, but heavy traffic inhibits potential cyclists.	Design studies? Identification of right-of- way width? General feasibility study?	2	(Feasibility study possible-design work not CTPS focus)
2. East Acton Village Center	Acton Planner	Town would like to create small, commercial "village center"-type area in East Acton	Traffic/circulation/ pedestrian studies in support of alternative concepts	3	
3. Concord/Sudbury bikeway	Concord planner	There is interest in seeing abandoned rail right-of-way considered for bikewav	Feasibility study	2	
4. Reconnaissance to find park- ride lots within MAGIC	Carlisle MAGIC CTPS	There are relatively few park-ride lots for carpools/vanpools within the MAGIC area & few multi-modal options such as bike/pedestrian connections	Investigation of potential to create additional park-ride lots within MAGIC at supermarkets, other large parking lots	1	
5. Rt. 225 bikeway	Carlisle	Regional bikeway connector		2	
6. Acton Bikeway					

E. ROADWAY IMPROVEMENTS					
1. Barriers to Alternative Solutions/Design Standards	MAGIC	Need to identify to pursuing promising options Need to work on suburban/rural design standards to prevent use of urban design in MAGIC.	MARPA committee is mtg. Mobility would improve if standards changed to be acceptable to towns.	1	
2. Consolidation of curb cuts at Route 117 retail area, Stow	Stow Town Planner	Town is negotiating with owner to provide internal circulation roadways to eliminate excessive curb cuts.	Traffic analysis of improvement concepts	5A	
3. “Terrible Triangle”, Maynard	Maynard Planner	Intersection of Route 27 at Concord Avenue provides poor circulation, believed to be high-accident location.	Circulation/accident studies	5B	
4. Route 2A(Acton) safety/119 (Littleton)	MAGIC	Towns would like to see coordinated plan for corridor, including turn improvement lanes, signals, sidewalks, crosswalks for development traffic	Corridor study	2	
5. Intersection of Lower Main & Wilkins St., Hudson	MAGIC	Intersection unsafe for traffic turning left onto Wilkins Street	Isn’t this in congested intersection study?	5C	Isn’t this in congested intersection study?
6. Massachusetts Avenue/ Waltham Street intersection, Lexington	Lexington Econ. Devel. Coord.	Congested local intersection could benefit from study.	(already included in “Congested intersection” included study)	5D	(already in “Congested intersection” study)
7. Downtown Rotary, Hudson	Hudson Asst. Town Admin	Chronic traffic congestion at rotary (Main and Washington Streets), but with limited improvement possibilities	Congested intersection- type study	5E	
8. Massachusetts Ave/Route 4-225 near Wilson Farms), Lexington	Lexington Planner	Unsignalized Intersection with heavy demand-should be considered for signal.	Traffic signal warrant study	5F	
9. Route 2 Traffic	MAGIC	Study how to facilitate “smart” growth of fledgling nodes to accommodate the growth potential along the corridor	Corridor study	3	

10. Routes 27, 111, 62, 85, 117 and 119	MAGIC	Corridor study of these local arterials. Update 117 corridor study to include Cisco.	Corridor study	4	
11. Hanscom Access	MAGIC	Route to Hanscom is not easily accessible by car, LOS is F or worse during peak periods		5G	
12. Route 117 / Wataquadock Hill Rd intersection, Bolton	Bolton Town Coordinator	Intersection is badly configured, in need of improvements	(already included in "Congested intersection study")	5H	(already included in "Congested intersection study")
13. Route 117/Forbush Mill Rd intersection	Bolton Town Coordinator	Intersection badly configured, heavy traffic at donut shop, needs improvements	Congested intersection-type study	5I	
F. CUT-THROUGH TRAFFIC BY TOWN					
1. West Street cut-through traffic	Carlisle Town Planner	Cut-through traffic from other towns use Carlisle roads to bypass Route 3 and Route 4/225. Roads aren't designed to handle through traffic.	Identification of local cut-through demand on West Street-potential diversion or reduction strategies, and ways to reduce queues at Route 4/225 intersection with Route 27		
2. Concord cut-through traffic	Concord Planner	Town has similar concerns to Carlisle-traffic from the north using Concord roads to avoid Route 3 and Route 4/225. Has installed 4-way stop sign at one location to address, resulting in long intersection queues.	Study of effectiveness of measures already applied, and additional strategies to divert, reduce, or otherwise accommodate cut-through traffic		

Project/Study	Source	Primary Issue(s)	Type of Work Needed/ Requested	Rank	CTPS Applicability
G. MISCELLANEOUS OTHER					
1. Parking studies downtown, Hudson.	Hudson Asst. Town Admin	Parking inadequacies downtown are a chronic complaint; town willing to add parking, but needs information about nature of problem	Parking study to identify occupancy, parking duration, parking purposes, etc.		
2. Before-and-after study, pending Ii-495 developments	MAGIC	General concern among MAGIC communities about far-reaching area impacts of large-scale developments along 1-495	Traffic counts, etc., to identify area-wide traffic impacts of major new developments along 1-495.		
3. Parking Study, Phase II, Lexington	Lexington Economic Develop ment Coordinator	Follow-on work from Phase I parking study, about to be completed by consultant.	(Unclear-needs more discussion with Town)		
4. North-south travel deficiencies	MAGIC	Investigation of improvement options to facilitate north-south travel within MAGIC communities	Feasibility study? Major Investment Study?		
5. Advisory Group for general MAGIC transportation issues	MAGIC	Desire for ongoing review of transportation status within MAGIC	Creation of group like Route 2 TAC, for general MAGIC oversight		(Not a CTPS issue except when project-based)
6. Transit-district zoning/financing modifications	Bedford Planner/ MAGIC	Several towns implementing commercial zoning changes to tie variances to imposition of "transit fees"	Documentation of current experience, assessment of applicability to MAGIC communities (e.g., Boxborough TIF)		
7. Public Education Package	MAGIC	There's a need for a more visible "public information" campaign to convince people of the benefits of using transit and paratransit modes.	Develop materials for distribution in Town Halls, elsewhere, on benefits of, opportunities for - ride-sharing	1	(Caravan is responsible agency)
8. Tax Increment Financing	MAGIC	Work with communities to facilitate multi-modal traffic/transit improvements when TIF is used by new or expanding businesses			

3. Roland Bartl, Town Planner, Acton

(Note: e-mails, transcribed and edited to eliminate transmission data)

Comment 1:

-----Original Message-----
From: Roland Bartl <rbartl@town.acton.ma.us>
To: marymcs@ctps.org <marymcs@ctps.org>
Date: Wednesday, September 26, 2001 3:36 PM
Subject: Draft Magic Subregional Area Study

In the Draft Phase I Report I found that Table 2-7 cannot possibly represent average assessed valuation for Year 2000. If you used building permit valuations you copared apples with oranges since different towns use diferent rating systems. In Acton, the building permit valuation is completely disconnected from assessment valuations or market value.

Drawing conclusions from building permit info to establish a picture of new home market values is not possible, at least in Acton - and I suspect the same is true for most other communities. I do not have the exact number, but average new home assessed and market value in Acton in 2000 was at least $350,000, but probably significantly higher. For accurate info, please contact assessor Brian McMullen bmcmullen@town.acton.ma.us.

On table 2-8, I think ENSR moved to Westford or Littleton last year. This needs verification.

Response:

-----Original Message-----
From: Mary McShane [SMTP:marymcs@ctps.org]
Sent: Wednesday, September 26, 2001 4:47 PM
To: Roland Bartl
Subject: Re: Draft Magic Subregional Area Study

Roland, thanks very much for taking the time to comment--I haven't gotten many comments on the "fine print" of the report, and I do appreciate it. I shouldn't have used the word "valuation" in the heading, but that's what MISER seems to call this data (see site below):

http://www1.miser.umass.edu/datacenter/housing/Ytd2000_12.pdf

I should have stuck with the Census term "Construction Cost" which is what the U.S. Census calls it. I may end up leaving out that column altogether in the final version of the report to avoid confusion, because I'm not sure how to go about getting a consistent "market value" number for all the towns. Incidentally, the source quoted is MISER and I had thought they originiated the information; but in fact, they seem to have gotten it from the Census (see site listed below).

http://tier2.census.gov/cgi-win/bldgprmt/prmtplac.exe

Don't know about ENSR, but I'll check on it. Thanks again.   Mary

Additional Comment:

Thread-Topic: Draft Magic Subregional Area Study
From: "Roland Bartl" <rbartl@town.acton.ma.us>
To: "Mary McShane" <marymcs@ctps.org>

Sure, this is what the MISER and CENSUS data may say, but I know they are only correct in their reflection of the value the building department puts on them to calculate a building permit fee. There is not much other use for these numbers. Again, for info that better reflects market values contact the various Town's assessing departments. I gave you the contact for Acton - don't know the others.

4. Elizabeth Newman, Concord Transportation Planner

From: "Elizabeth Newman" <ENewman@concordnet.org>
To: <marymcs@ctps.org>
Cc: "Marcia Rasmussen" <MRasmussen@concordnet.org>
Subject: MAGIC Draft Phase I Report
Date: Monday, October 15, 2001 2:01 PM

Mary,

Thank you for taking the time to talk with me last week about the MAGIC Subregional Area Study Phase I Report. I spoke with Marcia Rasmussen, the Planning Director and we have the following comments on Table 5-1 List of Potential Projects/Studies for Phase II:

1) Item D-4; The Concord Board of Selectmen has begun to actively pursue the possibility of acquiring an abandoned railroad right-of-way that runs from the Sudbury town line, through West Concord, to the Acton town line for the development of a pedestrian/bicycle path. This abandoned right-of-way travels adjacent to a number of significant Town conservation lands, scenic permanently protected open space, a large public middle school and bisects the thriving village style community of West Concord. The abandoned right-of-way would provide direct and convenient access to the commuter rail station, as well as various shops and stores in West Concord. Additionally, the State is in the process of drafting conceptual drawings for the Route 2 Rotary Redesign. A feasibility study of the abandoned rail right-of-way as a pedestrian/bicycle path would lend support and possibly make recommendations on how the path could continue across Route 2 into the commercial area of Acton along Rt. 2A/119. We strongly support having this project continue to Phase II.

Please email or call me at 978-318-3287 if you have any questions or need additional information.

Thank you,

Elizabeth

RESPONSE TO COMMENTS BY:
Elizabeth Newman, Transportation Planner, Town of Concord

Comment	**Response**
A	We hope to include a feasibility study of the Concord-Sudbury bicycle/pedestrian path in Phase II of the MAGIC study.

5. Judy Alland, MAPC MAGIC Coordinator

December 5, 2001

TO: Mary McShane, CTPS
FR: Judy Alland, MAPC
RE: Comments on MAGIC Subregional Area Study

Location	**Original**	**Comment or Proposed Change**
INTRODUCTION		
P. 1, para 1	"The group originally . . . specific services."	"The group originally approached CTPS expressing an interest in identifying opportunities to increase alternative transportation options and expand ~~selected~~ or add shuttle transit services such as those already operating . . . "
	"Phase I will be followed . . . Phase I."	"Phase I will be followed by a Phase II, which ~~includes~~ will consist of studies of specific ~~problems or issues~~ opportunities to increase alternative transportation options identified in Phase I."
P. 1, para 3	"Rt. 4/225 in Lexington and Bedford"	Add Carlisle?
	"In addition . . . transit service."	Add to problems cited: lack of reverse commute opportunities
	"More generally . . mode"	More generally, MAGIC reps see lack of transit opportunities and other transportation options as a particular problem; and are most interested in finding new service options for work and other trips, to ~~replace~~ reduce the use of the single-occupant auto as the predominant mode."
	At the end of para 3, add new sentence:	"Local officials are quick to point out that these transit improvements would reduce congestion in general and the pressure on Rt. 2 traffic in particular."
P. 1, para 4		Mention the Rt. 2 CAC & note that it was initiated by MAGIC. Add details later, probably on p. 28
P. 2, top	List of 3 improvement items – "reaching consensus," "investigating alternatives," "addressing issues"	Phrasing here sounds like all process, no action outcomes. Presumably the intent of the process is to achieve tangible roadway improvements. Add something about ultimate objectives?
P. 2, last para	"It compiles . . . problems."	"It compiles . . . and includes a list of planning studies or activities which may merit additional data collection and analysis to ~~address recognized transportation problems~~ explore promising opportunities."
	"It acknowledges . . . meeting these needs."	"It acknowledges the preferences expressed by MAGIC members for transit- or paratransit-type solutions; ~~but recognizes~~ it notes the conventional wisdom held by transportation agencies that the suburban-rural nature of most of these communities severely limits the applicability and potential usefulness of traditional transit services in meeting these needs; and it further notes that, in spite of these perceived limitations, MAGIC is eager to find and pursue innovative, 'outside the box' solutions."

Fig. 1-1 (Map)		Label Rt. 111
2. RECENT TRENDS: EMPLOYMENT, POPULATION, DEVELOPMENT		
P. 5-6, Employment		Add somewhere here, maybe after para 1: "In some cases, such as Digital, many small employers are replacing a single large employer. From a transportation perspective, this may make it harder to organize for and pursue transportation alternatives."
P. 6, top	"Whether population . . . clear."	"Whether population and housing growth can support these high levels of industrial/commercial development is less clear; if not, workers will most likely commute to the new jobs in the region from elsewhere, especially the north and west, adding to traffic congestion."
Pps. 6-12	Housing discussion	Housing discussion could be meatier & relate better to transportation/land use planning. We have building permit data (single vs. multi-family) for 1990-2000 by community; it will show that most new housing is single-family, adding to cost, sprawl, & SOV demand. Most new housing is also pricey, meaning lower-wage workers travelling farther & w/o reverse commute transit. Discuss especially the concept of jobs:housing balance & how it relates to transportation, w/ J:H ratio per MAGIC town. **I can help with all this.**
P. 13, middle	"Other towns, including . . . Maynard . . .; however, their vacant industrial areas tend to be smaller parcels . . ."	Is this true for Maynard? Isn't there still lots of space at Clock Tower?
P. 13, para 4	"These sites . . . initiatives"	"These sites . . . ; they are of interest because ~~businesses smaller than this size are unlikely~~ they are likely to be good candidates for commuter ride-sharing initiatives."
		Add after the above paragraph or nearby: "Multiple smaller employers at or near the same site, although harder to identify, also present an opportunity for ride-sharing initiatives, especially if the property is under single management, such as Clock Tower Place."
		Also in this section, add information on the tools communities have used (e.g., TIFs) to make developers responsible for strong TDM measures & services.
		Somewhere here: add discussion of non-work destinations/origins & how they relate to emp. Centers or potential shuttle routes – shopping, medical, elderly housing, schools, etc.
P. 16-21		Karen's comments will improve this. Needs to reflect the many development pressures, including marketplace, state aid distribution, & tax-policy-driven need to use fiscal zoning to bring in revenue.

3. RECENT TRENDS: TRANSPORTATION

p. 25, para 2	Last sentence	"In the MAGIC subregion . . . the I-495 corridor is emerging as the new locus of rapid . . . development for the same reasons that made Route 128 ~~successful~~ attractive in earlier years."
P. 28, mid-dle		Add info on Rt. 2 CAC – how it was formed, its progress, current status
P. 39	Commuter rail, para 1	Add outbound service times, including trains to Fitchburg; include both AM & PM; note any express service, historic or current. Note the difficulty in getting urban workers to the growing # of suburban jobs. Note environmental justice concerns.
	Discussion of commuter rail parking	Can you provide a table showing # parking spaces/station? Add before "There is resistance": "MAGIC officials have long expressed a need for a regional station with parking to accommodate commuters from beyond the subregion, reducing pressure on existing stations and on Rt. 2; although potential locations are controversial, the concept remains a good one."
	"The preferred local site . . . existing station."	Add: "or other alternative site."
	"Some travelers . . . ; others would continue to prefer South Acton, because of the higher numbers of train departures and arrivals at the station."	Add: "More frequent and earlier service to and from Fitchburg, coupled with more parking in Littleton and beyond, would reduce pressures on South Acton."
P. 49	Discussion of shuttle & Clock Tower	Note that Clock Tower is **not** a large company (one of the report's criteria for success) but a concentration of smaller companies under a single property mgmt firm. Note too that the town played a role in creating shuttle service there through its TIF agreement.
Some where in this sec'n		Add a list of TMAs, what they do, & whom they serve. Add also a brief discussion of the potential for &/or barriers to other TMAs.
P. 52	After 1st sentence	Add: "It is important to note that congestion throughout the region would decline if there were more transit, paratransit, and other alternatives that would get people out of single-occupant automobiles."

5. NEXT STEPS

p. 67	"The results of these discussions . . . Table 5-1."	Add reference to & location of revised & ranked list provided by MAGIC.
	Para 2: "Under Phase II . . . outlined>"	"Under Phase II of the study, a subset of the issues, locations, and opportunities identified in Table 5-1 and in the revised and ranked Table #__ appearing on page __ will be investigated . . ."
	After last para	Add: "Other important MAGIC priorities may not lend themselves to CTPS studies. MAGIC, in concert with

		neighboring communities, major employers, legislators, transportation agencies, and others needs to develop strategies to accomplish these. Of special importance are reverse commute service and agreement on a regional parking facility.”
6. OBSERVATIONS AND CONCLUSIONS		
p. 73	Bullet #2, last sentence	Doesn’t Bedford have a policy limiting parking?
	Bullet #3	“The high price of land and large-lot, single-family zoning ~~housing~~ . . . makes it difficult for this area to provide housing affordable to employees . . .” Add at the paragraph end: “More housing that is affordable to a range of incomes and is near jobs would help alleviate traffic.”
	Bullet #4 (b)	Talk about outbound service issues
P. 74	Bullet #4 (c)	“Large single-employer sites and multiple smaller employers at a single site under one management company such as Clock Tower Place . . . are the most promising sites for vanpool and carpool formation . . .”
	Bullet #7	“MAGIC members exhibit little interest, as an outcome of this study, in studies which evaluate existing roadway deficiencies and suggest improvements.”
	Bullet #8	Add to future community groupings: “and Fitchburg Line communities in MAGIC & beyond should work together on improving service along that line.”

RESPONSE TO COMMENTS BY:
Judy Alland, MAPC

Com-ment	**Response**
A	Text modified to reflect sense of comment.
B	Text modified to include "opportunities."
C	Carlisle added.
D	Text added in following sentence to reflect MAGIC perception that lack of reverse commute opportunities is a problem.
E	Text added to reflect sense of comment.
F	Text added to reflect local officials' belief that transit improvements would reduce congestion and pressures on Route 2. Past evidence suggests that, in reality, even major improvements in transit service have relatively small impacts on congestion on parallel routes (see, for example, CTPS "Old Colony Commuter Rail Service Restoration Transportation Impact Study").
G	Short description of Route 2 CAC origins provided. It is our understanding that the original CAC was created to support the CTPS Route 2 long-range studies of the early 1990s; and that the group was later reactivated by Lincoln, Concord and Acton to provide a longer-term mechanism for liaison with MassHighway regarding Route 2 operations and proposed improvements.
H	Text modified to discuss objectives more concretely.
I	"…explore promising opportunities" added.
J	The statement made expresses more than "conventional wisdom": it reflects many years' experience of supporting experiments in suburban transit in the Boston area which have, on the whole, been unsustainable in the long term. It also reflects the conclusions of planners, transit operators, and researchers around the country, who have clearly defined the conditions (development patterns, limitations on free parking, etc.) which are needed to make such services viable, and which do *not* characterize most of the MAGIC communities. However, MAGIC's interest in continuing to pursue such options is clearly stated here and elsewhere.
K	Route 111 now labeled on maps.
L	Paragraph added.
M	Sentence added.
N	Building permit data was updated to October 2001, so that the four most recent years are presented, amply demonstrating the preponderance of single-family construction as new housing throughout MAGIC communities. Building permit valuation data was removed from **Table 2-7** at the recommendation of the Acton Town Planner (see comments by Roland Bartl, above), and we did not try to establish comparable estimates of average new house price for MAGIC towns. There is an extended discussion of the jobs:housing imbalance issue in CTPS's Demographics of Commuting report, a reference to which has been added.
O	It is our understanding that Clock Tower Place was fully occupied as of January 2001, when we interviewed the manager there. We learned during the recent visit by MAGIC that Clock Tower has since lost several tenants, including New England Restaurant Associates; but a recent newspaper article in the MetroWest Daily News (Sunday November 11, 2001) reports that Clock Tower is still "…95 percent full."
P	Additional text, as well as a footnote, have been added to clarify this. Large-size businesses *may* be good candidates for ride-sharing programs if they also have involved, pro-active management; small-sized businesses generally are not receptive at all to ride-sharing promotion interventions, for the reasons stated.

Q	See preceding response. Footnote particularly addresses the characteristics which make Clock Tower unique in this area. To the extent that other MAGIC sites exhibit similar characteristics (no parking, poor roadway access, concentration in a dense complex of buildings), they too would be good candidates for ride-sharing initiatives: the mill complexes in Lowell and Lawrence come to mind as the closest analogues to Clock Tower Place. Unfortunately, most typical office park locations don't exhibit these kinds of characteristics.
R	We are not as well versed as you at MAPC about mechanisms such as TIF agreements, and are unprepared to comment with any degree of confidence on their efficacy with respect to influencing local developer investment decisions
S	Only a limited discussion of the relationship between work and non-work trips has been added. The principal difficulty with suburban transit type services is that demand is too low to allow all-purpose service throughout the day, as is common in dense urban areas. If non-work travel is to be served through these modes, it must be specifically targeted, almost always at high cost.
T	The multiplicity of pressures on suburban towns in a tax-averse environment is acknowledged.
U	Wording changed as requested.
V	See response to Comment G, above.
W	Added sentences indicate the number of reverse-commute trains currently operating on the Fitchburg Line, and direct interested parties to the recent CTPS study of reverse-commuting opportunities by rail. That report also contains a discussion of "environmental justice" and how that objective might be better served by improved service within Boston and other nearby cities and towns than by increased reverse commuter rail service.
X	Added as Table 3-5. This table is based on data from MBTA's web site.
Y	Added as requested.
Z	As pointed out in the CTPS reverse-commute study, more frequent and earlier service to and from Fitchburg would require a major capital investment. More parking in Littleton and beyond should continue to be pursued. Such parking increases would result in some modest reduction in current pressures at South Acton; but the greatest numbers of parkers at that location, from Acton itself and from Stow, would not be diverted to parking farther out.
AA	See Footnote added on page 48. Clock Tower is a fairly unique property in this location, not typical of the kinds of businesses and institutions which are willing to sponsor shuttle services for employees and/or customers. If there are other facilities similar to Clock Tower—which also provide employee shuttle services without meeting all, or most of, the criteria listed—we haven't heard of them.
BB	Brief discussion of TMAs active in the MAGIC area and vicinity added.
CC	See Response to F, above. More transit, paratransit and other alternatives would provide more mobility options for suburbanites, but would not reduce traffic congestion. In fact, to the extent that such services increase accessibility of these areas to more people, they may actually increase development pressures and "urban sprawl," and thereby increase congestion in the long run. In a society where auto ownership is nearly universal, rail extensions make it easier to commute from long distances, but non-commute trips still tend to be made by automobile.
DD	List modified to include MAGIC rankings; also, copy of MAGIC-submitted list included in Appendix.
EE	See Response to DD above.
FF	Sentence added to indicate alternative study mechanisms: other agencies, consultant studies sponsored by local initiative, others.
GG	Bedford does have a parking limitation in its zoning law; sentence changed to reflect this.
HH	"…large lot, single-family…" added. While increased affordable housing is in itself a worthy goal, we have no evidence by which to conclude that "..more housing that is affordable….would help alleviate traffic."

II	Sentences added to indicate limited potential for reverse-commute rail services.
JJ	See Responses to P and Q, above.
KK	The referenced statement was deleted in response to a comment by the Littleton representative (see K. McNamara comments, above)
LL	Statement added to indicate that affected communities should work with the MBTA to investigate opportunities for improving service on the Fitchburg Line.

APPENDIX C

Technical Memoranda Prepared in Support of Draft Phase I Report

Tech. Memorandum #1: Employment Data for MAGIC Study: Data Sources and Evaluation

Tech. Memorandum #2: Bedford Local Transit: Directions to Consider for Improving Service

C T P S   Central Transportation Planning Staff
Staff to the Boston Metropolitan Planning Organization

MEMORANDUM

TO: **MAGIC Files**

19 December 2000
(modified 2 January 2001)

FROM: **Mary P. McShane**

RE: **Technical Memorandum #1:**
Employment Data for MAGIC Study: Data Sources and Evaluation

As part of the MAGIC subregional study, CTPS has been looking to identify sources of employment data, by site, for companies located within MAGIC towns. The reason for undertaking this effort is to develop a clearer picture of where within MAGIC large concentrations of employment exist, in an effort to identify likely candidates for alternative kinds of transportation services. While data on total town-wide employment is obtained relatively easily from the Massachusetts Department of Employment and Training, comprehensive and up-to-date site-specific data on individual employers is not publicly available. Town planners and engineers typically do not have this kind of information, and assessors' records provide only a very indirect source of information on employment typically requiring a large investment in study time to obtain.

Several alternative sources of site-level employment data were found to be available. These included the following, some of which were also used in the MetroWest subregional study:

1. CTPS's 1991 employer dataset. This dataset represented a one-time purchase, used for regional model development and other purposes. When new, it was a comprehensive source of employment data for employers of all sizes in the Metropolitan Region; it was extensively updated by CTPS to reflect a 1996 base year, but is still outdated given the availability of more recent sources.

2. MAPC's employment dataset. This dataset has been used by MAPC for a number of studies over the past few years. Its source was a 1995 dataset compiled by Mass. DET for a one-time study, and made available to MAPC. This dataset, too, appears to be comprehensive and we understand it has been updated to some degree. Again, however, more recent information appears to be available.

3. Dun & Bradstreet's published *Regional Business Directory* for Massachusetts. This set of volumes provides data on companies by town, and zip code within town, giving telephone numbers, address, SIC code, names of chief officers, and annual sales.
   --the volumes are updated every year (currently: Year 2000 edition), but all employers are not revisited every year.
   --tends to miss new start-ups and recent closures.
   --not comprehensive—does not include all businesses

--nevertheless useful as a backup reference because it, alone among sources, clearly **differentiates site employment** from **total company employment**.

4. Dun & Bradstreet's *Microcosm.* This resource provided much of the same data as the Regional Business Directory, available on microfiche; but it offered much more comprehensive coverage of businesses of all sizes within towns. Unfortunately, the last edition published for this resource was issued in 1997/98, and there are no plans to continue publishing it.

5. InfoData's *American Business Disk.* This source is available as a read-only CD, searchable geographically, by employer size category, and by business type. It appears to be the same database used by internet search engines to locate and provide travel directions to businesses and individuals.
   --this source, like *Microcosm*, appears to be quite comprehensive. In addition, it appears to be fairly up-to-date, at least with regard to business activity up to about the last 6-9 months. The version examined was the Year 2000 disk. It is not known whether or not this source will be updated annually.
   --the only drawback to use of this data involve the employment size data. Employer size is provided by category (e.g., '100 to 249 employees') rather than as discrete estimates. Also, for larger employers, the size category may include more than one site—it is difficult to clarify this from the documentation.

Initial efforts at employer identification used the Regional Business Directory, as the most definitive, if not comprehensive, source. Data from that primary source were presented at the MAGIC committee meeting of November 9. Subsequently, the American Business Disk data were added to the initial cut. The CTPS employer dataset was used mainly for historical comparison with current data, and verification of long-standing businesses.

The ABD dataset was queried to identify all employers within categories representing 100 or more employees (e.g., "100 to 249", "250 to 499"), and the data downloaded to a GIS database. The data were mapped by grouped employment categories, as shown in **Figure 1-1**. The concentrations of large employment sites in Bedford and Lexington are particularly prominent, with Concord and Acton also representing areas where numerous large employers are located.

To address concerns voiced by the Bedford representative to MAGIC, analysis was undertaken to determine the likely proportion of total employment in several towns that is represented by employers of 100 or more. For three towns (Bedford, Lexington, Stow), the entire employment dataset was downloaded from the American Business Disk. The data was analyzed by size category to develop percentages of total employment represented by each category in each town. Because only category data is presented, a single value was assumed to represent the site-level employment within each category, using the following assumptions in order to be as consistent as possible with MAPC overall employment totals for each town:

--the category mean (arithmetic average) typically does **not** also approximate the modal employment within each category; categories are typically skewed to be

heaviest at the bottom end of the range. (For example, the "500 to 999" category has many more firms close to the 500-level than to the 999-level.)
--the largest categories are likely to be over-represented by firms, because these totals may represent more than one site. These categories were verified by checking with the RBD and CTPS datasets, and substituting a reduced employment estimate where this seemed appropriate. The resulting estimates are still higher than actual total employment levels, but the resulting percentage distribution gives a better basis for estimating the proportion of employment represented by smaller firms.

The results of this analysis are summarized in **Tables 1-1** to **1-3** below. They indicate that, across the board, the largest numbers of firms in these towns are small firms, employing 20 or fewer people. However, for the towns having a large employment base, at least half (for Bedford, well over half) the town's employment totals are represented by a small number of large or very large firms. Similar results would probably result if the analysis were repeated for all MAGIC towns: only in towns with limited industrial or commercial activity do small businesses represent more than a small share of overall employment.

These results are important, because they illustrate that the large employers are the most promising focus of interest in terms of sheer numbers, with respect to soliciting employer cooperation in providing alternative travel services for their employees. This is a well-known observation in any case, because only large employers are likely to have the recruitment and parking problems which may make them willing to cooperate actively in the provision of such services.

An additional check on the reasonableness of ABD employment levels was made using assessor's data for the town of Lexington. For two locations within Lexington (the Hartwell Avenue corridor and the Hayden Avenue/Spring Street area), assessor's data indicating total developed gross square footage by parcel was summed over all parcels, and the result converted to estimates of employment using a rough value of 400 square feet per employee. The employment estimates by address for individual parcels were compared with the employment totals from the ABD database, but with larger employers adjusted as described above to represent site-specific (rather than company-wide) employment levels more closely. The resulting comparisons are presented in **Table 1-4A** and **B** for Hartwell Avenue, and **1-5A** and **B** for the Hayden Avenue/Spring Street area.

For Hartwell Avenue, the two approximation methods yield similar results in terms of estimated total employment. For the Hayden Avenue/Spring Street area, the employment estimates differ by about 700 (2700 vs. 3400), with the higher estimate associated with the ABD data. A third analysis, performed for all commercial properties with Bedford Street addresses, yields total employment estimates of 2030 and 2340 for the assessor's data and ABD data respectively.[1] These differences may represent a continued *over*estimate of large employers within the ABD data, which should be adjusted downward; or they could represent a time lag in one or the other dataset in a volatile real-estate market. Most likely, they simply reflect the degree of approximation represented in this approach—but the approximation is good enough for the present purpose, i.e., locating employment clusters of sufficient critical mass to make them potential targets of ride-sharing or other services.

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[1] The tables documenting this analysis are not included here, but are available to interested parties.

Finally, the data obtained from the ABD dataset for smaller employers (less than 100 employees) were address-matched and plotted on the same map envelope as **Figure 1-1,** just to illustrate with a scatter-diagram the locations of employment activity. On casual observation, the map shown in **Figure 1-2** does not appear to contain as many points as are listed in the "numbers of firms" totals on the analysis tables. There are 2 reasons for this:

> --it was not possible to find address matches for the entire dataset, particularly for new business entities, using the 1990 Census TIGER files; and,
> --in any case, it is difficult to show many points representing small employers at this scale without considerable overlapping, particularly at building locations housing multiple employers (e.g., office parks).

Consequently, the picture presented in **Figure 1-2** is not a picture of *total* employment in the MAGIC communities. However, it does give insight into the spatial distribution of the *greatest share* of employment in these communities. The original database is a better tool for estimating *total* employment and employment densities: employment at individual building locations comprised of multiple employers (e.g., office parks) can be identified in the database by sorting by address, and summing individual employment estimates for each company, as was done in Lexington for the comparison with assessor's data. The resulting estimates of employment and employment densities are probably as good as can be obtained from these available data sources.

TABLE 1-1
Estimated Distribution of Employer Size: BEDFORD

Size Category: Employees per Firm	Assumed Average Employment per Firm*	No. of Firms in Size Category	Percent of Total Firms	Est. Numbers of Employees	Percent of Total Employment	Cumulative Percent of Employment
10000 +	---					
5000 to 9999	---					
1000 to 4999	NA	6	0.9%	9550	49.4%	49%
500 to 999	NA	4	0.6%	1211	6.3%	56%
250 to 499	NA	8	1.2%	2100	10.9%	67%
100 to 249	100	17	2.4%	1700	8.8%	75%
50 to 99	60	21	3.0%	1260	6.5%	82%
20 to 49	25	59	8.5%	1475	7.6%	90%
10 to 19	12	61	8.8%	732	3.8%	93%
5 to 9	6	114	16.4%	684	3.5%	97%
1 to 4	1.5	405	58.3%	608	3.1%	100%
		695	100%	19320**	100%	100%

*Used instead of arithmetic averages to allow totals to approximate MAPC employment total for town;
NA indicates that individual site values, from Mass. Regional Business Directory, were used instead of
assumed average.

**MAPC employment total for Year 2000: 19938

TABLE 1-2
Estimated Distribution of Employer Size: LEXINGTON

Size Category: Employees per Firm	Assumed Average Employment per Firm*	No. of Firms in Size Category	Percent of Total Firms	Est. Numbers of Employees	Percent of Total Employment	Cumulative Percent of Employment
10000 +	NA	2	0.1%	925	4.4%	4%
5000 to 9999	0	0				
1000 to 4999	NA	6	0.4%	4200	19.8%	24%
500 to 999	NA	2	0.1%	1100	5.2%	29%
250 to 499	NA	14	1.0%	2795	13.2%	42%
100 to 249	100	26	1.8%	2600	12.2%	55%
50 to 99	60	40	2.8%	2400	11.3%	66%
20 to 49	25	108	7.4%	2700	12.7%	79%
10 to 19	12	117	8.1%	1404	6.6%	85%
5 to 9	6	314	21.6%	1884	8.9%	94%
1 to 4	1.5	822	56.7%	1233	5.8%	100%
		1451	100%	21241**	100%	100%

*Used instead of arithmetic averages to allow totals to approximate MAPC employment total for town;
NA indicates that individual site values, from Mass. Regional Business Directory, were used instead of
assumed average.
**MAPC employment total for Year 2000: 21109

TABLE 1-3
Estimated Distribution of Employer Size: STOW

Size Category: Employees per Firm	Assumed Average Employment per Firm*	No. of Firms in Size Category	Percent of Total Firms	Est. Numbers of Employees	Percent of Total Employment	Cumulative Percent of Employment
10000 +	---					
5000 to 9999	---					
1000 to 4999	---					
500 to 999	950	1	0.4%	950	45.6%	46%
250 to 499	---					
100 to 249	100	1	0.4%	100	4.8%	50%
50 to 99	60	2	0.8%	120	5.8%	56%
20 to 49	25	9	3.6%	225	10.8%	67%
10 to 19	12	15	6.0%	180	8.6%	76%
5 to 9	6	39	15.7%	234	11.2%	87%
1 to 4	1.5	182	73.1%	273	13.1%	100%
		249	100%	2082**	100%	100%

*Used instead of arithmetic averages to allow totals to approximate MAPC employment total for town;
NA indicates that individual site values, from Mass. Regional Business Directory, were used instead of
assumed average.
**MAPC employment total for Year 2000: 2118

Table 1-4A
Hartwell Avenue Employers
(Source: American Business Disk, 2000, with adjustments)

NAME	STR_NO	ADDRESS	SIZE CATEGORY	EST.NO. EMPLOYEES
Raytheon Optical Systems	4	Hartwell Pl	100 to 249	100
US Trust	7	Hartwell Ave	10 to 19	12
NUMBER Nine Visual Tech Corp	18	Hartwell Ave	50 to 99	60
Sparta Inc	24	Hartwell Ave # 2	5 to 9	6
Standard & Poor's Dri	24	Hartwell Ave # 1	250 to 499	400
Adult & Pediatric Dermatology	29	Hartwell Ave # 4	1 to 4	1.5
Evans Sara MD	29	Hartwell Ave	1 to 4	1.5
Feldman Mitchell J MD	29	Hartwell Ave	1 to 4	1.5
Gappelberg Ghary MD	29	Hartwell Ave	1 to 4	1.5
Geller David MD	29	Hartwell Ave	1 to 4	1.5
Hartwell Pediatrics	29	Hartwell Ave # 100n	1 to 4	1.5
Lexington Internal Medicine	29	Hartwell Ave	10 to 19	12
Nathan Toby MD	29	Hartwell Ave	1 to 4	1.5
Patriot Pediatrics	29	Hartwell Ave	10 to 19	12
Winger Christine E MD	29	Hartwell Ave	1 to 4	1.5
CAFE Jazmin	32	Hartwell Ave	1 to 4	1.5
Logica Inc	32	Hartwell Ave	1,000 to 4,999	400 *
Game Fx Inc	35	Hartwell Ave	20 to 49	25
Nextel Communications Inc	40	Hartwell Ave	100 to 249	100
PIONEER-Standard Electronics	44	Hartwell Ave	50 to 99	60
Avidyne Corp	81	Hartwell Ave	20 to 49	25
Boeing CO	81	Hartwell Ave # 9	1 to 4	1.5
Deitz David MD	81	Hartwell Ave FL 2	1 to 4	1.5
Gte Laboratories	81	Hartwell Ave	1 to 4	1.5
Ipswitch Inc	81	Hartwell Ave # 7	50 to 99	60
Optimed Medical Systems	81	Hartwell Ave FL 2	20 to 49	25
Wildfire Communications	81	Hartwell Ave # 3	50 to 99	60
Equinox Group	91	Hartwell Ave	10 to 19	12
Rosemary's Cafe	91	Hartwell Ave	1 to 4	1.5
Webhire Inc	91	Hartwell Ave	250 to 499	250
Workgroup Technology Corp	91	Hartwell Ave	100 to 249	100
Hartwell House Inc	94	Hartwell Ave	50 to 99	60
Instrumentation Laboratory Inc	101	Hartwell Ave	250 to 499	500
Ctc Communications Corp	110	Hartwell Ave	20 to 49	25
Eastern Research Group Inc	110	Hartwell Ave	100 to 249	100
Lexington Group	110	Hartwell Ave	10 to 19	12
Macro Chem Corp	110	Hartwell Ave # 5	20 to 49	25
Biokit USA Inc	113	Hartwell Ave	5 to 9	6
Varian Vacuum Products	121	Hartwell Ave	250 to 499	200 *
Cancer Bio Science	125	Hartwell Ave	50 to 99	60
Lexington Management Inc	125	Hartwell Ave # 4	1 to 4	1.5
Stevens Group	125	Hartwell Ave # 3	5 to 9	6
Compaq Computer Corp	131	Hartwell Ave	250 to 499	250
D & K Sharp Construction		Hartwell Ave	1 to 4	1.5

* = value adjusted downward using RBD data

2986 = total est. employment

Table 1-4B
Hartwell Avenue Parcels
(Source: Lexington Assessor's Data)

Parcel_id	No.	Street Name	Comm. Gross Flr Area	Est. Employmt
008000010D	4	HARTWELL PL	45000	113
0084000081	7	HARTWELL AVE	10456	26
008400070C	14	HARTWELL AVE	33600	84
008400080A	17	HARTWELL AVE	30104	75
008400070E	24	HARTWELL AVE	128936	322
008400080B	25	HARTWELL AVE	25404	64
008500010B	27	HARTWELL AVE	58056	145
008400083B	32	HARTWELL AVE	66977	167
0085000021	35	HARTWELL AVE	46784	117
008400084A	40	HARTWELL AVE	30351	76
0079000051	44	HARTWELL AVE	26533	66
008500018A	45	HARTWELL AVE	49880	125
008000004A	81	HARTWELL AVE	71250	178
008000004B	83	HARTWELL AVE	41444	104
008000010C	91	HARTWELL AVE	118156	295
007300009A	94	HARTWELL AVE	11403	29
008000010B	101	HARTWELL AVE	40600	102
0073000011	110	HARTWELL AVE	54345	136
007400008A	113	HARTWELL AVE	105960	265
00740007+9	121	HARTWELL AVE	86677	217
0074000010	125	HARTWELL AVE	37830	95
007400006A	131	HARTWELL AVE	77763	194
0080000001		HARTWELL AVE	0	
0080000006		HARTWELL AVE	0	
0080000003		HARTWELL AVE	0	
0080000002		HARTWELL AVE	0	
0080000009		HARTWELL AVE	0	
0073000012		HARTWELL AVE	0	
0079000050		HARTWELL AVE	0	
0079000049		HARTWELL AVE	0	

1197509 = total developed area, sf

2994 = est. employees
(@400 sf per employee)

Table 1-5A
Hayden Ave/Spring St Employers
(Source: American Business Disk, 2000, with adjustments)

NAME	STR_NO	ADDRESS	SIZE CATEGORY	EST.NO. EMPLOYEES
Lexington Medical Assoc	16	Hayden Ave	20 to 49	25
Mercer Management Consulting	33	Hayden Ave	250 to 499	300
Hampshire Chemical Corp	45	Hayden Ave	20 to 49	25
Sodexho Marriott Svc Inc	45	Hayden Ave	100 to 249	100
Spyglass Inc	45	Hayden Ave	5 to 9	6
First Consulting	55	Hayden Ave	20 to 49	25
Mac Donald Plumbing Heating	55	Hayden Ave	20 to 49	25
Atlantic General Insurance Inc	80	Hayden Ave	5 to 9	6
DE Wolfe Companies Inc	80	Hayden Ave	1,000 to 4,999	200
DE Wolfe Insurance Agency Inc	80	Hayden Ave	20 to 49	25
DE Wolfe Mortgage Svc	80	Hayden Ave	50 to 99	60
DE Wolfe Real Estate Svc	80	Hayden Ave	1,000 to 4,999	200
DE Wolfe Relocation Svc	80	Hayden Ave	50 to 99	60
Income Protection Planners	80	Hayden Ave	1 to 4	1.5
METROPOLITAN Insurance CO	80	Hayden Ave	10 to 19	12
Nardella & Taylor	80	Hayden Ave	5 to 9	6
Pillar Financial Advisors Inc	80	Hayden Ave	5 to 9	6
Troiano Stephen CPA	80	Hayden Ave	1 to 4	1.5
Madison Group Inc	92	Hayden Ave	10 to 19	12
Planning Technologies Grp Inc	92	Hayden Ave	20 to 49	25
Rath & Strong Inc	92	Hayden Ave	20 to 49	25
Corporate Chef's Inc	95	Hayden Ave	5 to 9	6
Fresenius Medical Care Hldgs	95	Hayden Ave	10,000 +	125 *
Circe Biodedical	99	Hayden Ave	20 to 49	25
Genta Inc	99	Hayden Ave	50 to 99	60
INTERNEURON Pharmaceuticals	99	Hayden Ave	20 to 49	25
J Howard & Assocs Inc	99	Hayden Ave	50 to 99	60
Adam PAINTING CO	63	Spring St	1 to 4	1.5
Auto Immune Inc	128	Spring St	20 to 49	25
Cafe Jazmin	128	Spring St	1 to 4	1.5
Efficacy Institute Inc	128	Spring St	20 to 49	25
Ledgemont Research Ctr	128	Spring St	10 to 19	12
Pharm-Eco Laboratories Inc	128	Spring St	100 to 249	100
Raytheon CO	141	Spring St	10,000 +	800 *
Community Therapeutic Day Schl	187	Spring St	20 to 49	25
Keds Corp	191	Spring St	50 to 99	60
Sperry Top Sider Inc	191	Spring St	20 to 49	25
Stride Rite Childrens Group	191	Spring St	250 to 499	150 *
Stride Rite Corp	191	Spring St	1,000 to 4,999	400 *
Stride Rite Intl Corp	191	Spring St	250 to 499	0 *
Stride Rite Sourcing Intl	191	Spring St	250 to 499	70
A B Initio Software Corp	201	Spring St	1 to 4	1.5
Auburn Insurance Inc	201	Spring St	1 to 4	1.5
Segue Software Inc	201	Spring St	250 to 499	250

* = value adjusted downward using RBD data

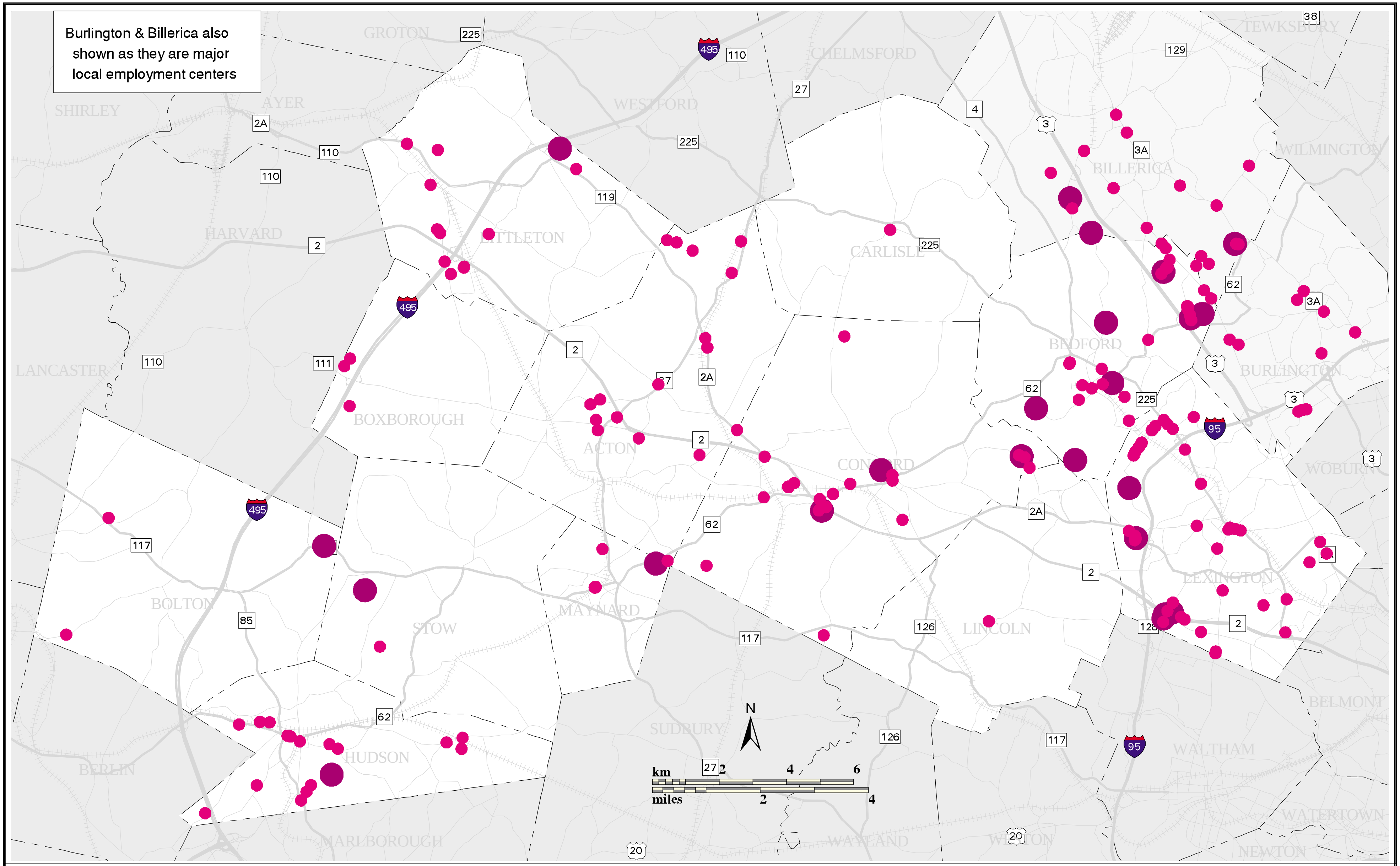
3395 = total est. employment

Table 1-5B
Hayden Ave/Spring St Parcels
(Source: Lexington Assessor's Data)

	Parcel_id	No	Street name	Comm. Gross Flr Area	Est.Employmt
#	001600001A	16	HAYDEN AVE	46035	115
#	001600001C	33	HAYDEN AVE	79823	200
#	001700020A	55	HAYDEN AVE	124947	312
#	0017000019	80	HAYDEN AVE	44993	112
#	001800004A	92	HAYDEN AVE	55924	140
#	001600004A		HAYDEN AVE	0	0
#	0017000021		HAYDEN AVE	0	0
#	001800003B		HAYDEN AVE	0	0
#	001800002B	124	SPRING ST	22768	57
#	001800014A	125	SPRING ST	53762	134
#	0018000015	131	SPRING ST	163794	409
#	002600044D	131	SPRING ST	95024	238
#	001800014B	141	SPRING ST	56050	140
#	001200013B	189	SPRING ST	49800	125
#	001200013A	191	SPRING ST	32448	81
#	001200013A	201	SPRING ST	32448	81
#	0017000022	95-99	SPRING ST	219505	549
#	001800003C		SPRING ST	0	0

1077321 = total developed area, sf

2693 = est. employees
(@400 sf per employee)



CTPS

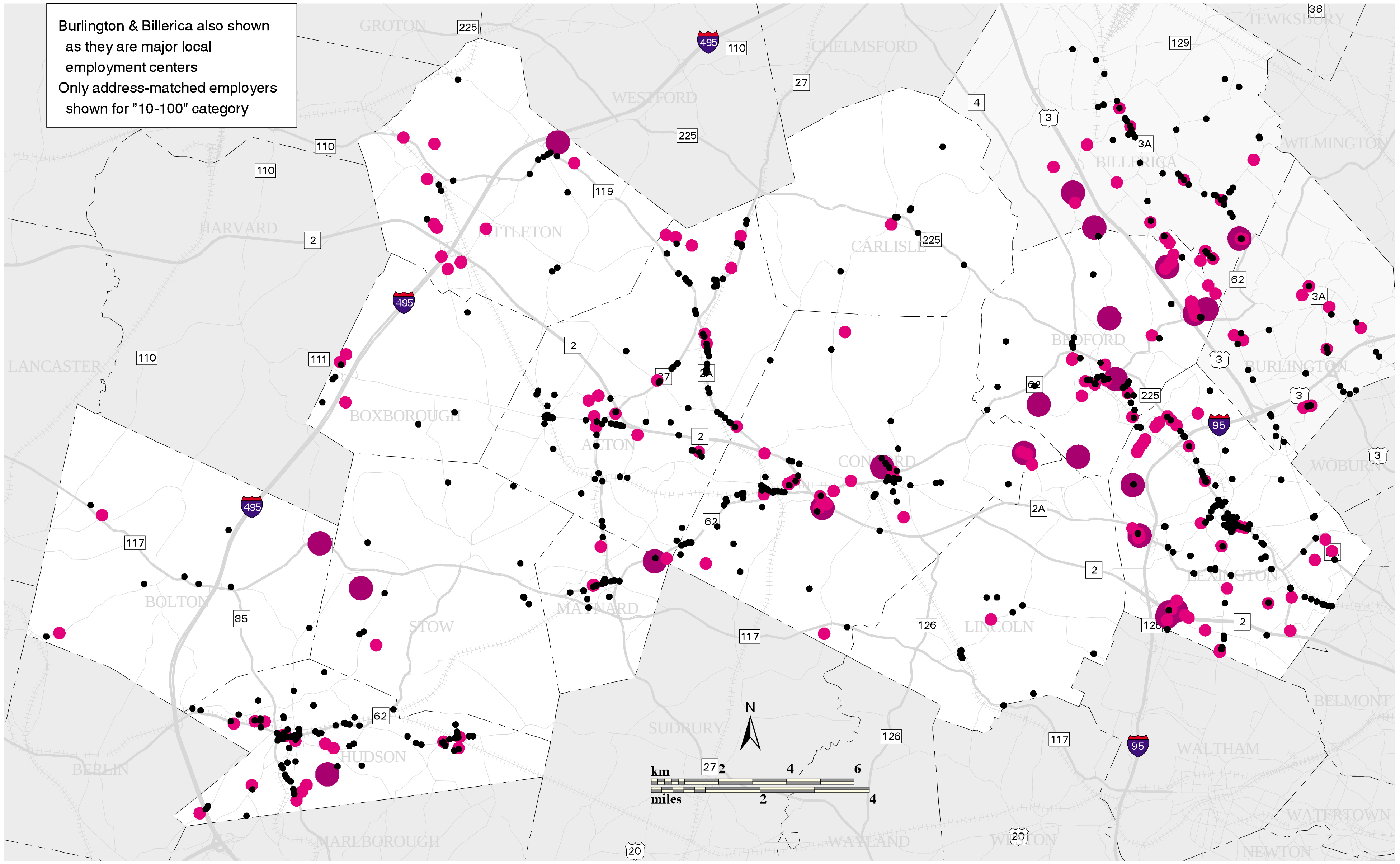
MAGIC
Subregional
Area Study

● **Over 500 employees**

● **100 to 500 employees**

Figure 1-1
Large Employers in
MAGIC Subregion

February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-32emp.aml


Burlington & Billerica also shown as they are major local employment centers
Only address-matched employers shown for "10-100" category

CTPS

MAGIC
Subregional
Area Study

● Over 500 employees
● 100 to 500 employees
• 10 to 100 employees

Figure 1-2
MAGIC Subregion Employers
(Including Size < 100)

February 05, 2002 /lycon/tadwork/magic/s62101/amls/pl_mg-33emp.aml

C T P S
Central Transportation Planning Staff
Staff to the Boston Metropolitan Planning Organization

MEMORANDUM

TO: **MAGIC Files** **June 29, 2001**

FROM: **Mary McShane, Clinton Bench**

RE: **Technical Memorandum #2: Bedford Local Transit: Directions to Consider for Improving Service**

One element of the MAGIC scope of work is the assessment of Bedford Local Transit, and suggested modifications to that service. Bedford Local Transit currently consists of a single van which operates almost exclusively in demand-responsive mode. Calls for demand-response must be placed between 8 and 9 AM, and the service operates door-to-door during the following hours only, Monday through Friday:

9 am to 11:55 am
1 pm to 2:55 pm

In addition, there are two scheduled trips daily between Bedford Common and the Burlington Mall. The Mall trips are at 12 Noon and 3 PM, stopping at Bread & Circus, Stop & Shop, and the Burlington Mall. People who go out on the noon trip return on the 3 PM trip.

The vehicle, which is owned by the town, is an 11-passenger van which is fully handicapped-equipped. There is one primary driver, and one back-up. The service is partly subsidized through the 16(b) program. The principal driver indicates that around 80 percent of his ridership is elderly or handicapped individuals requesting trips to downtown shopping areas or to meet medical appointments at Beth Israel or Children's Hospital. He frequently makes a trip to Burlington, serving passengers for the Lahey Clinic as well as transfers to other services in that area (Lowell RTA runs, and the Burlington B-Line). Other riders are welcome, but the service can't accommodate most work trips because of the limited operating hours and demand-responsive nature.

The level of service expansion beyond this, which the town of Bedford would be willing to support, is not clear. This memorandum attempts only to discuss potential options which the town may wish to pursue on its own to expand and improve available local bus service. The two major options are: to expand the existing, essentially demand-responsive operation to provide day-long service with additional mall trips; or, to consider implementing one or more fixed-route mini-bus services on a trial basis.

Option #1: Add to existing demand-responsive service.

This option would require adding at least one additional driver and van, to offer service with expanded hours. Service hours could be broken into two daily periods, say:

7 am to 2 pm demand-responsive, plus 2 morning trips to the Mall
12 noon to 7 pm demand-responsive, plus 2 afternoon trips to the Mall

If the service remained demand-responsive, calls could be placed at any time during the day, and a dispatcher would be needed to cover telephones during the entire day, when vehicles are on the road.

Such expansion would certainly provide more flexibility to would-be patrons, who would probably still consist mainly of elderly, handicapped, and transit-dependent persons. However, the expanded hours would also make the service more available to local commuters (i.e., town residents working at local sites), and potentially to other travelers who have the option of planning their trips in advance.

Such service would certainly be a high-cost option, requiring at least 2 additional personnel and the capital and operating costs of an additional vehicle. It may be possible to acquire an additional vehicle by applying for grant funds to agencies which support elderly/ handicapped services of this kind. In the longer term, such a service would require high levels of subsidy which would need to be covered by the town, although again, grant support might be available through state or Federal agencies.

Option #2: Initiate a trial of one or more fixed-route mini-bus services

In past years, Bedford has supported two experiments with local bus services, neither of which was able to be self-sustaining after the trial period of state subsidy. In the event that Bedford desires to initiate new experiments with fixed-route buses, the following suggestions may help in determining how and where to proceed.

A. Identify major generators, or activities for which residents might use alternative access modes

Some of the potential destinations within Bedford are identified on the accompanying map. They include:

(1) the VA Hospital. The Hospital is currently served by MBTA route 62, which operates along Route 4/225, Loomis Street and South Road in Bedford; but has no transit access from the west, or from other points in Bedford.

(2) Bedford Town Hall/Library and high school area. This complex of buildings on Mudge Way probably represents a destination of interest to many Bedford residents, and a possible staging area/pulse point for multiple routes, if these are desired.

(3) Senior citizens' centers, retirement homes, and the like. It is likely that a large percentage of ridership on local services would consist of senior citizens who would benefit from having a bus stop close to where they live.

(4) Bedford shopping centers. The primary shopping areas within Bedford are located along Route 4/225, at Shawsheen Road and the Loomis Street area; but other small businesses along Route 4/225 would also be served.

(5) Middlesex Turnpike industrial area. This area is currently well-served with MBTA reverse-commute bus service from Boston, local bus service from Burlington, and the LRTA bus service from Lowell. However, there is no local bus service from Bedford.

(6) Extra-Bedford destinations. When local services cross town boundaries, there are additional coordination requirements among the affected towns, as well as with the State DPU and funding agencies. However, it is possible that Bedford residents would be interested in some kind of additional service to the following destinations:

--Burlington Mall
--Lahey Clinic in Burlington
--the new intermodal transportation center in Woburn
--Hanscom Air Force Base and/or Hanscom Field (access through Lexington or Lincoln)

Other destinations of potential interest, located outside Bedford, could be identified by Bedford local officials. Some communities have initiated surveys of their own residents, to get a better understanding of desired trip patterns and destinations of sufficient appeal to justify considering a local bus route.

B. Create a sample routing linking identified origin and destination sites

Figure 2-1 illustrates local street segments that have some possibility of generating ridership for a fixed route transit service. Since it is preferable from a customer service standpoint for the route to operate over the same streets on each trip, it may not be possible to serve all of these segments within a reasonable trip time. However, if town officials decide to implement such a fixed-route service, CTPS's Transit Service Planning Group can be of assistance in recommending route deviation strategies that would allow for additional flexibility and geographic coverage. Below are descriptions of the segments displayed in **Figure 2-1**.

Sample Route Segment #1:
Such a segment would provide access to residential neighborhoods to the services along Route 4/225. The route segment shown on **Figure 2-1** would make two loops through residential areas, with a potential detour to the Middlesex Community College and/or the VA Hospital, for anyone wishing to stop there.

Sample Route Segment #2:
Such a segment would provide alternate access to the Hartwell Avenue industrial corridor, and then would loop back around the South Road neighborhood.

Sample Route Segment #3:
Such a segment would provide alternate access to the Middlesex Turnpike industrial area, as well as the Burlington Mall.

A single minibus-type vehicle, owned or contracted by the town, would likely operate on a "figure-eight" routing through the town. Such a routing would allow for maximum coverage by the transit service while serving the town center on each trip. This would also allow for regular connections with existing MBTA local service on Bus Route 62. Such regular connections would effectively expand the destinations available to Bedford residents at a minimal cost to the town.

Two other MBTA bus routes also provide service to Bedford during peak commuting periods, and are shown on **Figure 2-2**: Route 170 (Dudley Station – Oak Park via Waltham Central

Square) and Route 351 (Alewife Station – Oak Park). Currently, these routes provide service only in the reverse commuting direction during weekday peak periods. It is possible that the MBTA would consider modifications to these routes to provide either commuter service between Bedford Center and Oak Park, or peak direction service between Bedford and an MBTA rapid transit station. Town officials are encouraged to participate in the MBTA's ongoing service planning process to advocate for changes that would benefit Bedford residents. **Figure 2-3** shows the potential coverage of expanded Bedford Local Transit service, existing MBTA local bus service, and modified MBTA commuter bus service.

Without a trial, it is difficult to estimate whether such local services would attract enough ridership to guarantee continuing Town support. Also, Bedford officials might have other ideas, based on previous experience with the Suburban Transportation Program experiments, about where routes or loops might be designed to attract ridership.

C. Estimate likely ridership, revenue, and service cost

As mentioned above, it is difficult to estimate with any accuracy what kind of demand such local services might attract. Standard travel forecasting methods are not very accurate at estimating demand for intra- or inter-suburban, non-commuter trips. However, one can obtain a reasonable idea of the demand for such services by examining previous experience, if any, and by comparing the proposed service with similar services in other nearby communities.

The original Bedford service, initiated in 1976 included one fixed route from Bedford Center to the Burlington Mall, with two additional vehicles providing demand-responsive service.[1] This service, along with services in Needham and Natick, were funded through the MBTA under a 1-year demonstration program, which was renewed in following years. The Bedford service maintained operation after MBTA funding of the Surburban Transportation Program was cut in January 1981. When the program revived in 1984, Bedford's service again received MBTA funding, as it does today. Between 1988 and 1992, ridership on the Bedford service averaged between 25 and 30 passengers per day. Ridership counts in November 2000 were about 26 passengers per day, using 1 vehicle.

The Town of Lexington, next door to Bedford, started its Lexpress service in 1980, also under the Suburban Transportation Program which funded Bedford. The Lexpress service has always had more service and higher ridership than the Bedford service: 452 passengers per day in 1992, 432 recorded in November 2000. Lexpress operates 6 routes with hourly headways, averaging about 70 riders per day on each route. Burlington's B-Line service is another similar nearby service, also operating 6 routes on hourly headways. No historic data for that service is available; but in November 2000, B-Line routes carried a total of 273 riders per day, or an average per-route of 48 riders per day. Both services operate for an 11-hour day (roughly 7 am to 6 pm).

The existing Bedford and Lexington services represent the range one might expect in ridership for a new service assuming 1 vehicle operating a sequence of loops around Bedford throughout the day—between 25 and 70 passengers per day, with 45-50 as the most likely average ridership. Of course, the actual ridership depends entirely on the specifics of the route or routes, the frequency of service, and the markets served: loops which serve neighborhoods or markets of relatively low auto availability and high transit dependence will certainly attract more riders than neighborhoods or markets where auto availability is almost universal. Multiple routes which operate at high frequencies would generally attract more patrons than a single, long looping trip with less-frequent stops at any one location; but such services would require additional vehicles, multiplying the cost. The number of patrons would be limited by the number of residents or businesses within easy walking distance of any route—the principal limitation of suburban services. Also, to the extent that services are duplicative of each other or existing services, their potential ridership will be split among the available services.

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[1] Humphrey, Thomas J., "Background of MBTA Suburban Transportation Program," Memorandum to PMT Files, March 11, 1993. The discussion of previous Bedford experiments under the Suburban Transportation Program is based on this memorandum.

Revenue estimates depend on fares charged. Lexpress in Lexington has a base fare of $1.00 for adults and students, 50 cents for seniors, and 25 cents for transfers. The B-Line service in Burlington charges 50 cents for adults, 25 cents for seniors, with free transfers. The base fare for Framingham's LIFT service is $1.50, with 75 cent-fares for seniors. All the above services also offer some kind of advance-purchase pass or ticket system to facilitate payment.

The current Bedford service charges a low fare[2] and is subsidy-dependent. Added fixed-route services might charge a fare of $0.50 to $1.00 per ride; or $1.00 to $2.00 per round-trip. The potential revenue assuming a charge in this range is estimated as follows:

REVENUE	Per route[3]	
	$0.50 per ride	$1.00 per ride
25 passengers per day (non-peak hours, like existing service)	$25./day	$ 50./day
50 passengers per day (full-day operation probably required)	50./day	100./day
70 passengers per day (maximum likely, with full-day service)	70./day	140./day

Operating costs would depend on the kind of service and vehicle used. Typical per-day per-vehicle costs for operating shuttle buses, based on bids by service providers for a recently-contracted service, are shown below:

COST

Minimum bid:	$320 per day per vehicle
Maximum bid:	$637 per day per vehicle

Note that these estimates are shown for 6-hour peak-period-only service (6:30-9:30 am and 3:30-6:30 pm), which is associated with the lower ridership estimates given above, and which might not meet the needs of a non-commuting clientele. If full-day service is desired, these estimates should probably be doubled. Note also that this assumes minibus-type vehicles. If standard-size buses were used in place of minibuses contracted by the town through service providers, the estimates would undoubtedly be higher.

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[2] Current fare structure:

Current fare structure:	intown service	$0.50 adults & youths	0.25 seniors
	Burlington Mall service	0.75 adults & youths	0.35 seniors

[3] Assuming all trips are round-trips, and passengers pay both ways.

Using the lower cost estimate ($320 per day per vehicle) but assuming a full day's operation on each route (11-12 hours = $640 per day per vehicle), the resulting cost/revenue comparison is as follows:

Service cost:	$640	per day per vehicle
Potential revenue:		
Max fare, max ridership	140	
Subsidy required	500	per day per vehicle
= Approx. annual cost[4]	**$125,000**	**per vehicle**
Min fare, avg ridership	50	
Subsidy required	590	per day per vehicle
= Approx. annual cost	**$147,500**	**per vehicle**

The likely range of annual operating cost required would therefore be roughly between $125,000 and $148,000 per year per vehicle in service[5]. Farebox revenue would represent between 8 and 22 percent of service cost under these assumptions. On a per-rider basis, the value of the subsidy offered each rider would be roughly between **$7.00** and **$12.00** per round trip per day.

D. Identify potential funding sources

It is assumed that the primary support for any such services would be Town-generated funding. The MBTA already subsidizes Bedford's existing service through the Suburban Transportation Program, and may not be able to provide any additional funding support. However, additional financial support might be sought through a number of other sources:

(1) The Transportation Demand Management program is funded through the federal Congestion Mitigation and Air Quality Improvement Program (CMAQ), with additional state highway funds. The program is administered through MassHighway Planning, with preliminary review of proposals and development of funding recommendations by a selection committee which includes Regional Planning Agency representation (in Bedford's case, by MAPC). Under this program, communities apply for startup funding[6] for initiatives or projects that will encourage high-occupancy vehicle travel and reduce traffic congestion or vehicle trips. Other suburban transit or paratransit projects have in the past received funding through this program.[7]

(2) The State's Executive Office of Elder Affairs has a formula grant program which makes funding available to local Councils on Aging, based on elderly population. While the amount of a typical grant would be insufficient to pay the capital cost of

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[4] Assuming weekends and holidays excluded—250-day year.

[5] Plus the cost of at least a part-time administrator/dispatcher—discussed further in Section E below.

[6] i.e., up to 3 years.

[7] Under the current year's timetable, proposals were due in February 2001 for projects hoping to receive funding in FY 2002.

purchasing a vehicle, such funds are used by many communities to pay part-time drivers of vehicles which are purchased through separate local initiative.

(3) Contributions from private industry, or private developers. Bedford may be better placed than many other towns in this regard, because of its burgeoning industrial base, and the opportunity town officials have, through the environmental review process, to extract commitments of support from local developers.

E. Develop a town-based administrative structure to operate and manage such services

The operation of services of this kind typically requires at least a part-time coordinator to handle day-to-day operational issues, and to deal with the contracted service provider. In addition, most of the successful services which currently operate in the MAGIC area have a town-based local Advisory Committee, which is empowered to:

--develop and oversee an annual budget;
--negotiate contracts
--hire and fire employees
--evaluate and recommend potential service changes; and,
--report to Town Meeting or other responsible town official on the operation, patronage and finances of the system.

For example, Lexington has a volunteer Advisory Committee which oversees operation of the Lexpress service. That group provides policy, route and financial guidance for the service, files grant applications for funding to appropriate sources, and reviews and approves annual reports prepared by the Service Coordinator, who is a Town employee. In Marlborough, a volunteer Mayor's Transportation Task Force was formed several years ago, which is performing similar services in that town, and in addition seeking funding from local businesses to start new routes.

Bedford already has a coordinator, who oversees the operations of the existing demand-responsive van service. In addition, it should consider seeking volunteers to participate in an ongoing committee to perform the service management functions listed above.

* * * * *

In summary, the above details the steps that a town like Bedford should be prepared to undertake if it wishes to expand local bus service on either a modest, or a larger, scale. CTPS would be happy to offer assistance in this effort, in the following areas:

(a) helping to define further the potential markets for such services. For example, work trips located within entirely Bedford were identified from the 1990 Census Journey-to-Work data, the latest available. **Table 2-1** below shows the number of work trips starting and ending within Bedford broken down to Census block-group level (see **Figure 2-4** for map of Bedford Census Tracts and Block Groups). The largest number of tripdestinations, not surprisingly, are in the Hanscom area and in the Route 3/Middlesex Turnpike industrial corridor. But most of the Hanscom-bound trips begin and end within the same block-group; i.e., they probably represent people who both live and work on the Base. The second big destination—the Route 3/Middlesex Turnpike area—offers the possibility of serving more people from other parts of Bedford with a local transit route.

Similar analysis can be provided using 2000 Census data, once this data becomes available. Some household data from the 2000 Census *is* now available, and is quoted on the MAPC web site. It shows a growth in the Bedford population 65 years and above between 1990 and 2000, from 1780 to 2311 persons. This represents the size of the potential market for services targeted toward the senior citizen community in Bedford.

(b) analyzing employer survey data, if this is available. We can provide Bedford with maps showing the density of origins for a single employer, or a group of employers located in proximity to each other, if the Town or Transportation Management Association can provide the raw survey data.

(c) providing advice on issues related to service operations: e.g., evaluating prospective routes and providing likely operating schedules and cost estimates of particular services given an assumption about numbers of available vehicles; also, providing ridership estimates based, for example, on estimates of population within walking distance of proposed routes.

(d) evaluating services once they are in place. CTPS staff perform boarding/alighting counts, peak load counts, and other field data collection for operating transit services around the region.

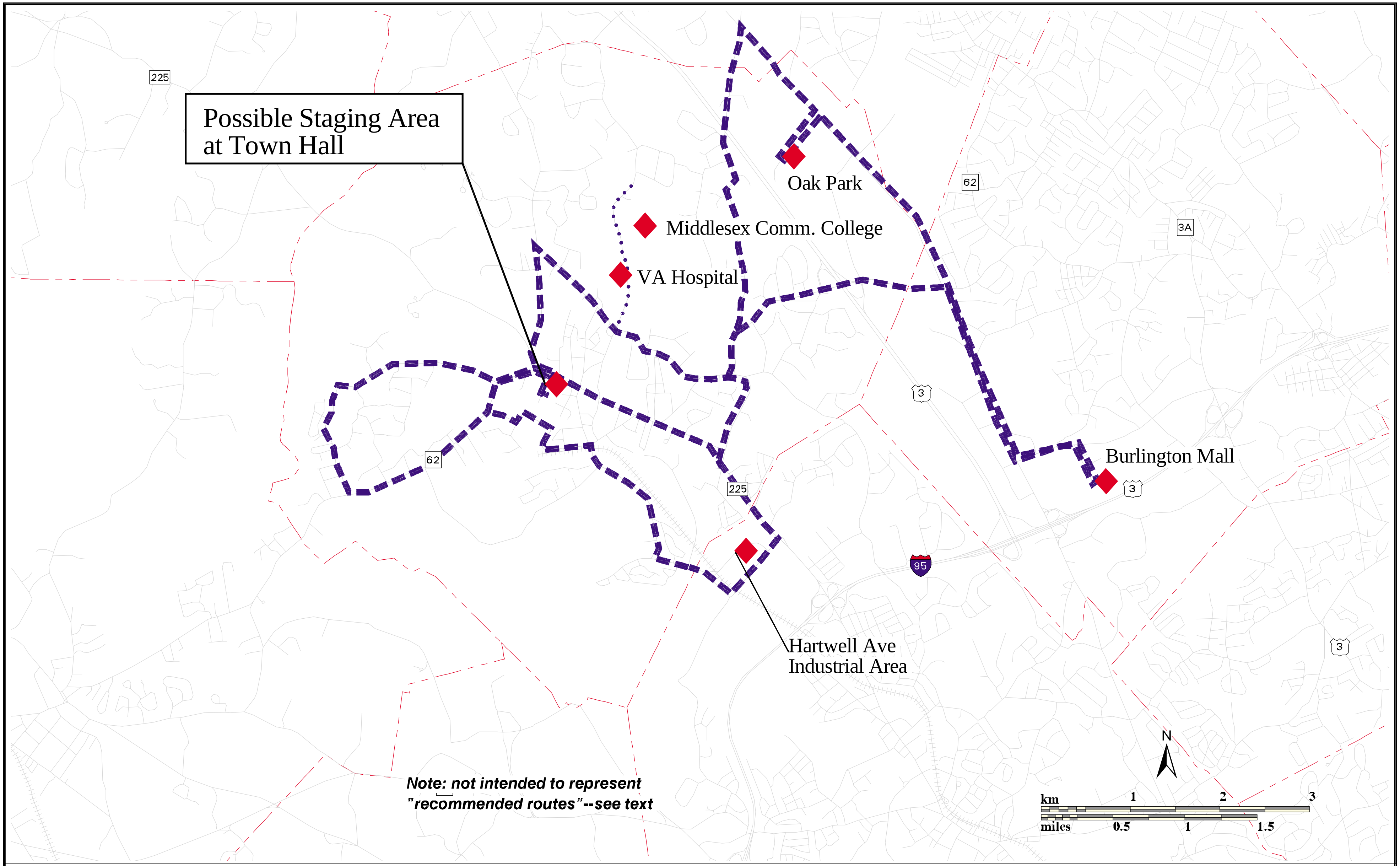
(e) advising town officials about the requirements and application deadlines for grant programs administered by MassHighway, the MBTA, and other agencies.

CTPS can work on any of the above types of task if authorized to do so under a work element included in an approved Unified Planning Work Program (UPWP).

TABLE 2-1
Origins and Destinations of Work Trips Within Bedford From 1990 Census

		DESTINATIONS Tract and Block Group*											
ORIGINS		3591					3592	3593					
Tract	Block Group*	1	2	3	4	9	9	1	2	3	4	9	Sum
3591	1	25		17		42		7				20	111
	2			17	12	38		16					83
	3	7	6	43	17	49		4			6	14	146
	4	20		34	31	105		17				64	271
	9	13		20		46				27		22	128
3592	9												0
3593	1	13		84	11	20		35				50	213
	2	42		36		89		13	16		16	18	230
	3	8		29	38	72		40		27	9	31	254
	4	8		37	26	113	8	22	5		7	66	292
	9	8		84		58		37			9	469	665
	Sum	144	6	401	135	632	8	191	21	54	47	754	
							Total work trips with Bedford origins & destinations:						2393
							Total work trips with Bedford origins, *any* destination:						6992

* See Figure 4, attached, for locations of Census Block Groups



Note: not intended to represent "recommended routes"--see text

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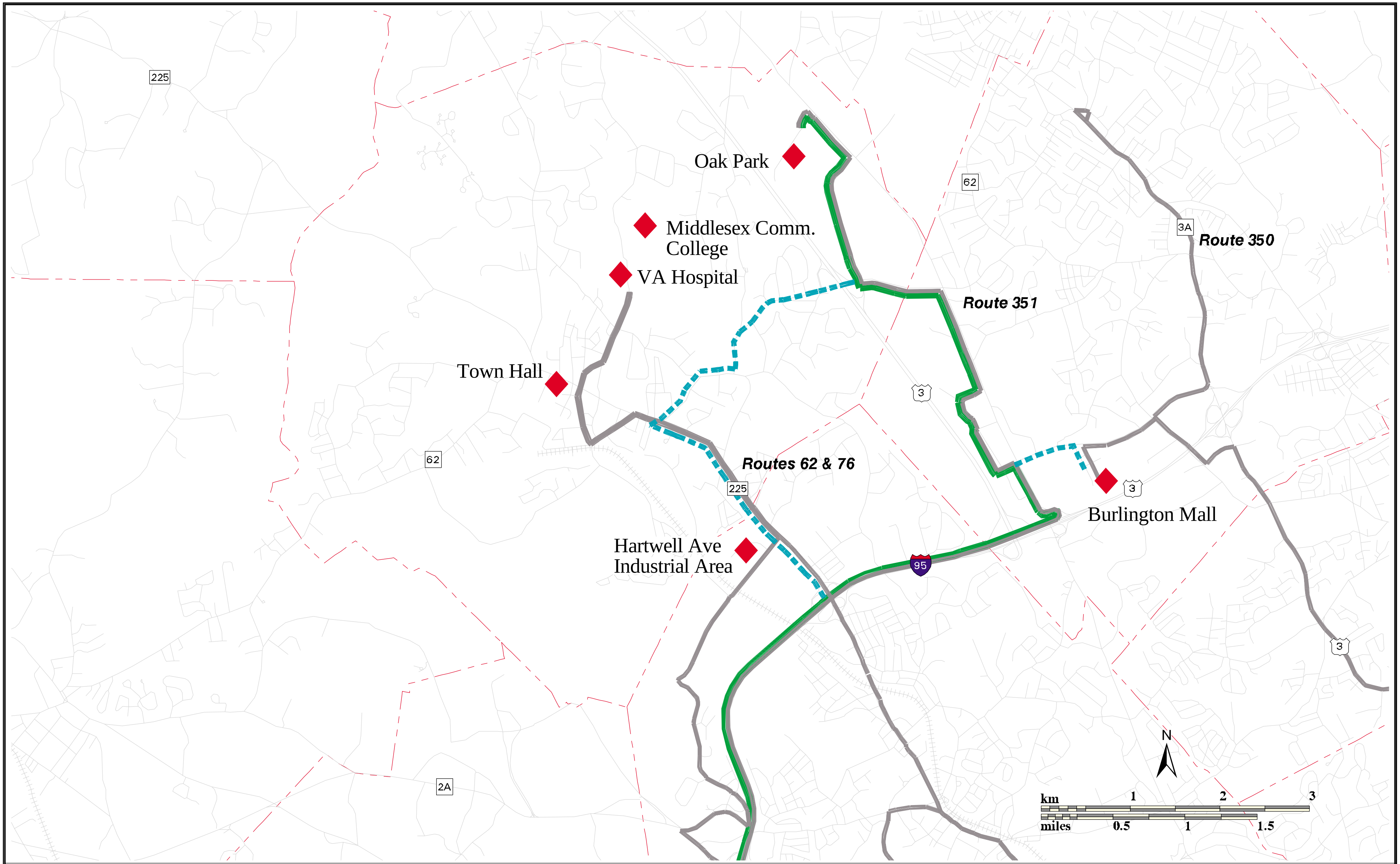
▬ ▬ **Sample route segment**
• • • • **On-demand detour**

Figure 2-1
Sample Route Segments for a Bedford Local Bus

February 05, 2002 62101 pl_mg-24tri.aml



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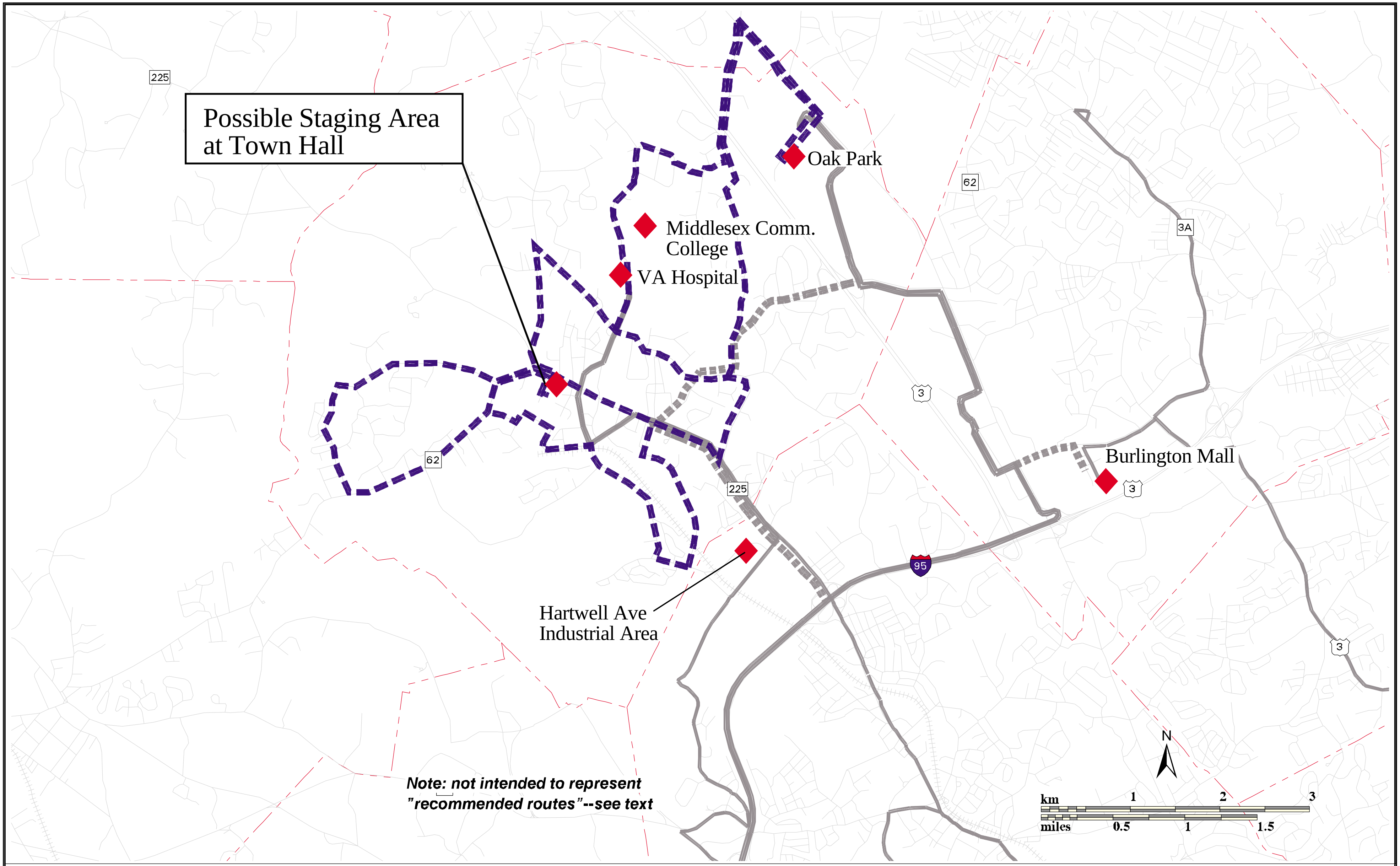
Existing MBTA Route 170

**Possible modification of MBTA Route 170
(for discussion with MBTA)**

Other existing MBTA bus routes

Figure 2-2
Sample Modifications to Increase Accessibility of MBTA Route 170

February 05, 2002 62101 pl_mg-27tri.aml



Note: not intended to represent "recommended routes"--see text

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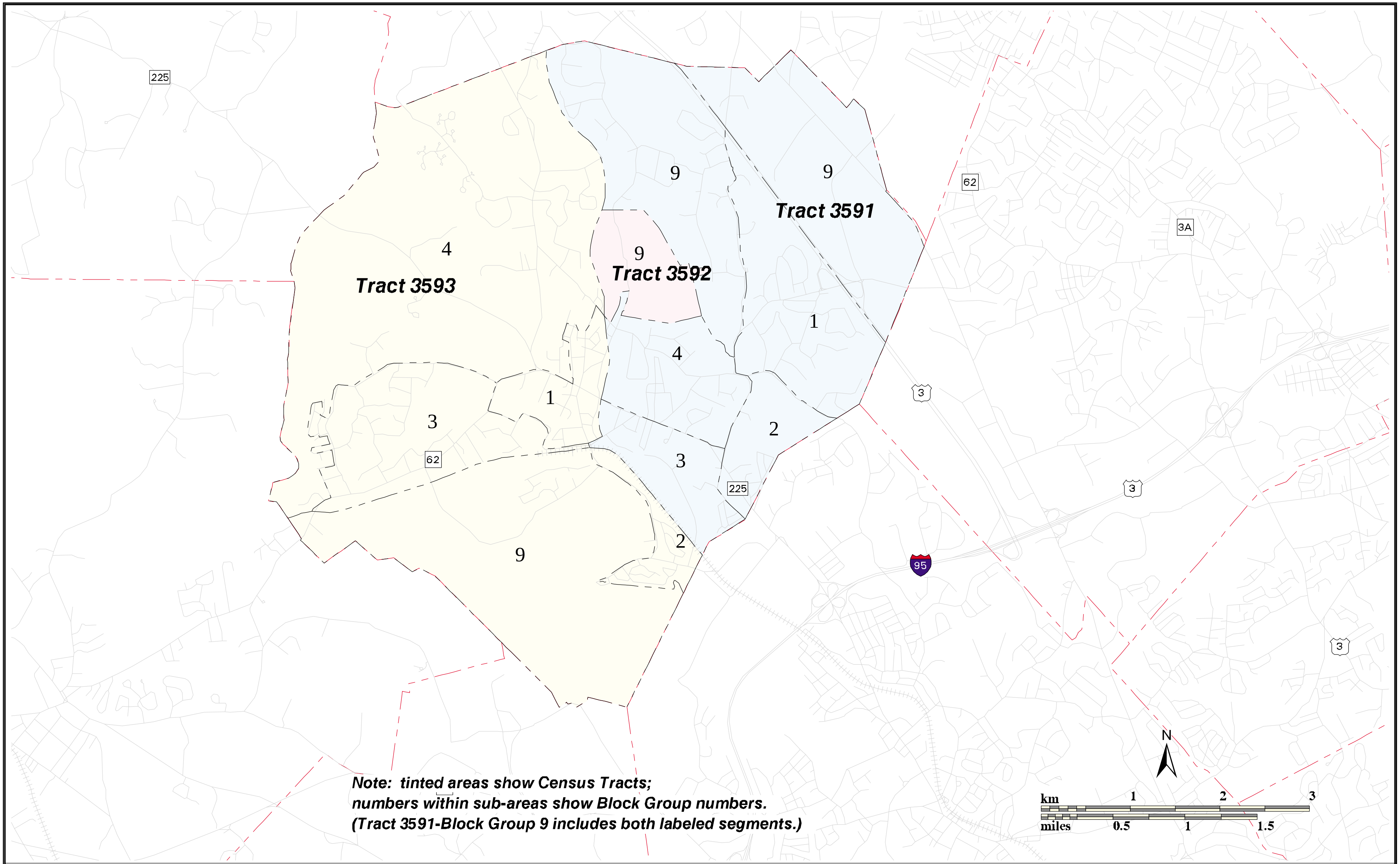
- ▬ ▬ Sample local bus route segments
- ▬ Existing MBTA bus routes
- ▪▪▪▪ Possible modification of MBTA route 170 (to be discussed with MBTA)

Figure 2-3

Sample Bedford Service Expansion with Modifications to MBTA Route 170

February 05, 2002 62101 pl_mg-26tri.aml



Note: tinted areas show Census Tracts;
numbers within sub-areas show Block Group numbers.
(Tract 3591-Block Group 9 includes both labeled segments.)

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Figure 2-4

Census Tracts and
Block Groups for Bedford

February 05, 2002 62101 pl_mg-25tri.aml